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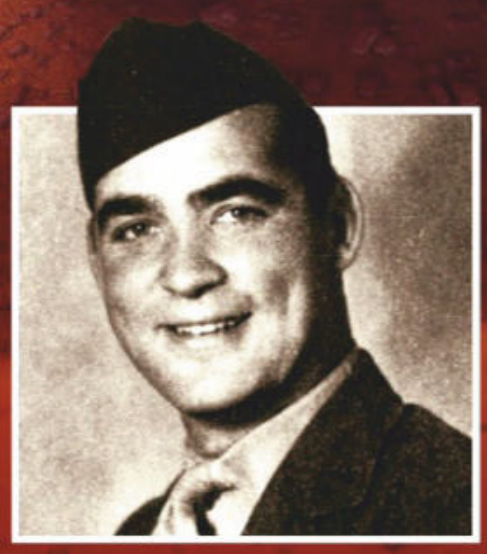

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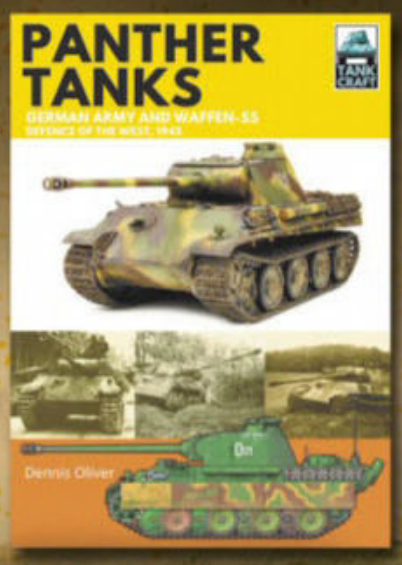

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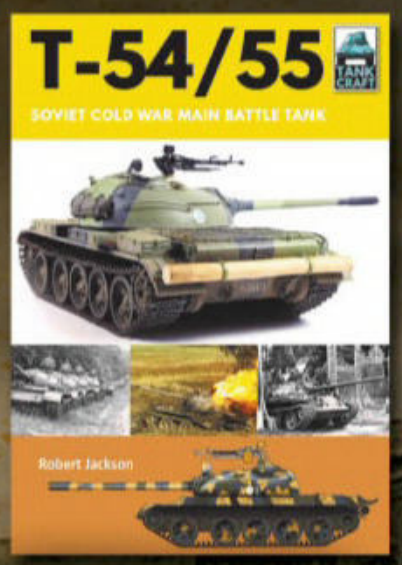

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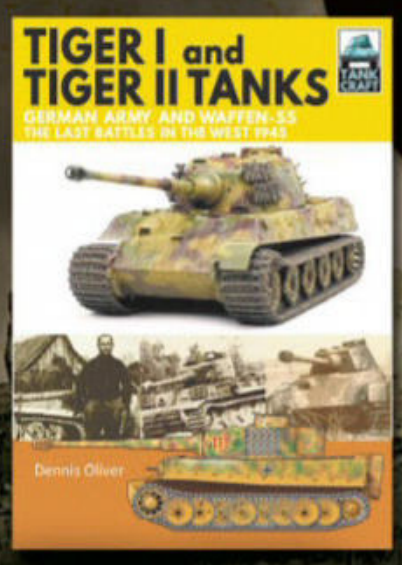

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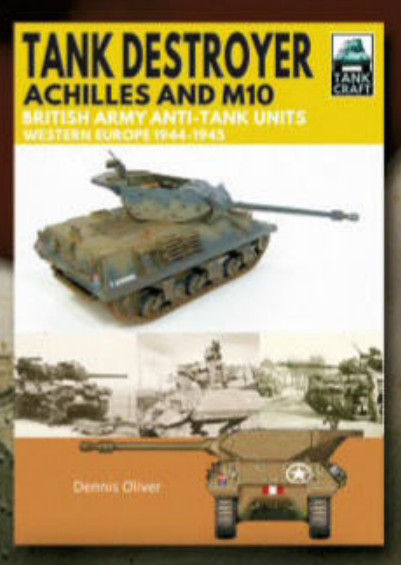

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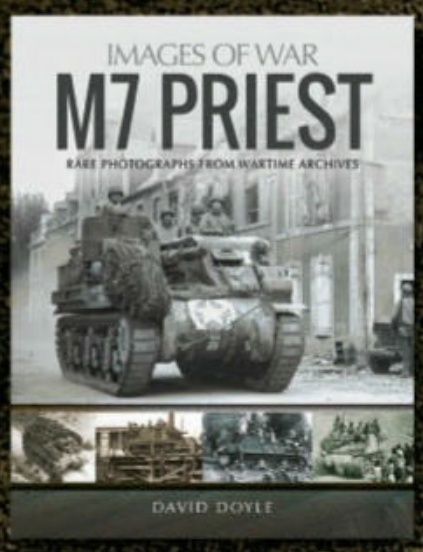

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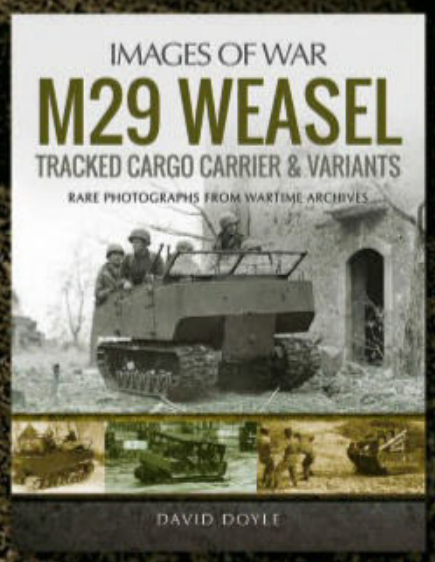

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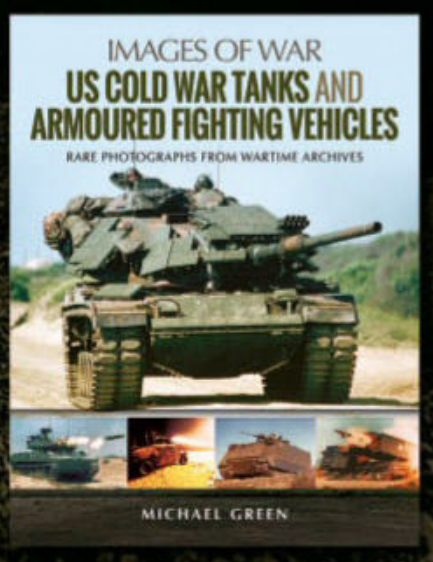

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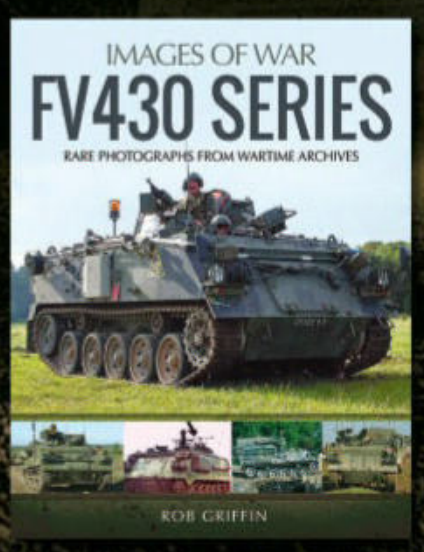

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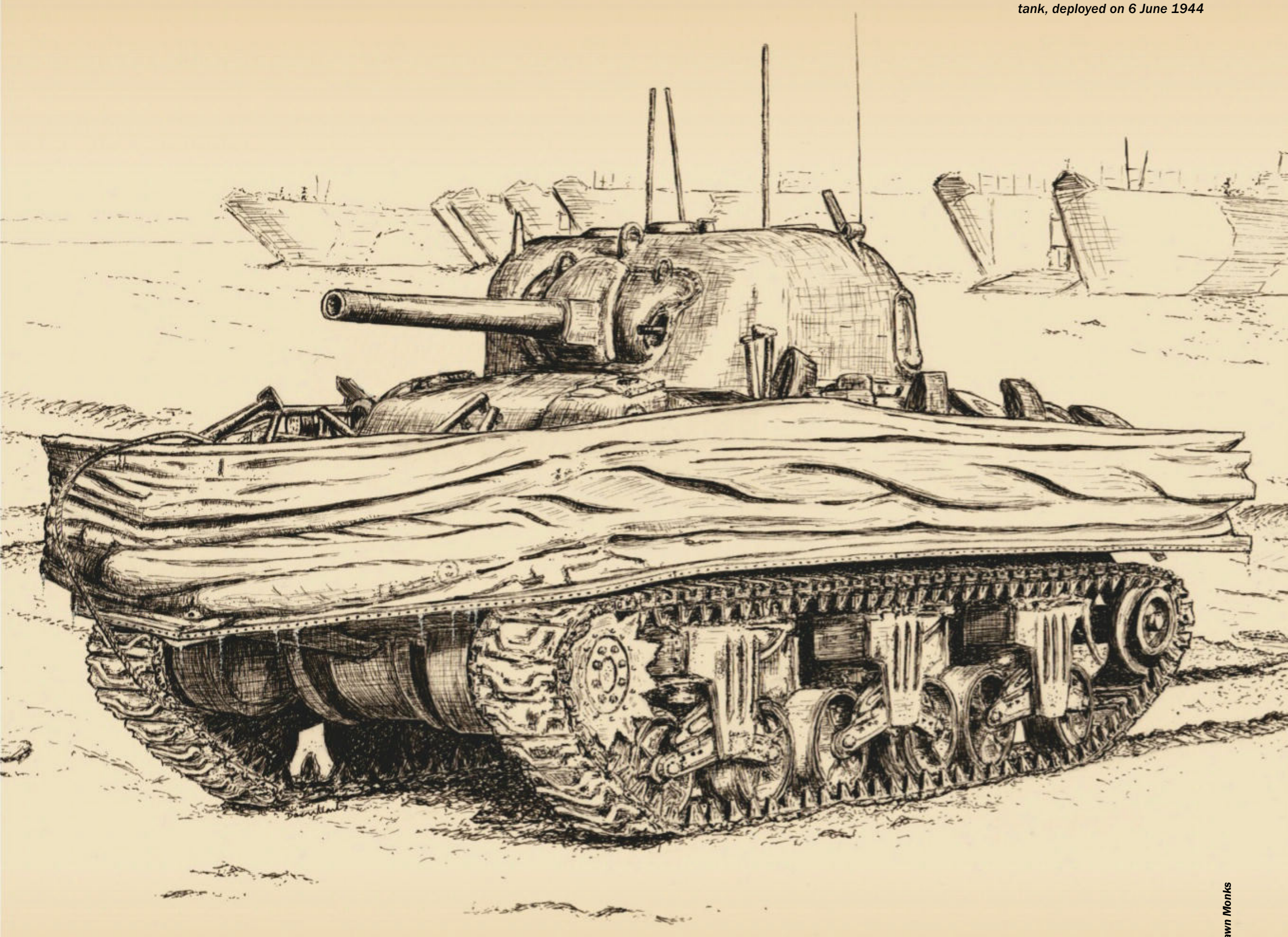

A Duplex Drive or 'DD' Sherman tank, deployed on 6 June 1944

Image: Dawn Monks

Welcome

From the debut of the Mark I in 1916, to the devastating attack of the Abrams and Challengers in Desert Storm, tanks have played an important and often decisive role on battlefields around the world.

In this special issue of **History of War**, we asked experts and historians to pick their 'greatest' tanks from across the century and around the world. Of course, comparing a Panzer I with a T-80 would be facile, so our '50 Greatest' list is made based on contributions to and importance within the history of the tank, be it accurate weaponry or impenetrable armour. Don't agree with our selections? As always you can get in touch with the team at: **frontline@futurenet.com**

Tim Williamson
Editor-in-Chief

CONTRIBUTORS

TOM GARNER

This issue Tom spoke with Keith Quilter, a Fleet Air Arm pilot veteran, who witnessed devastating kamikaze attacks on HMS Formidable during WWII (p. 72). In the Frontline, he explores the role of "Hobart's Funnies" on D-Day (p. 14).

MICHAEL HASKEW

Mike is an author and historian, with several published books on a range of WWII topics, as well as the history of armoured warfare. For this special issue he tackles the greatest examples of armour produced from around the world.

STUART HADAWAY

Located in the border region between Syria and Israel, the Golan Heights saw a brief but bloody tank battle during the 1973 Yom Kippur War. For this issue's Great Battles, Stuart recounts each stage of this armoured struggle (p. 56).

ISSUE 67

50 GREATEST TANKS

26 Historians reveal the toughest, most innovative and most important vehicles in the history of armoured warfare

Frontline

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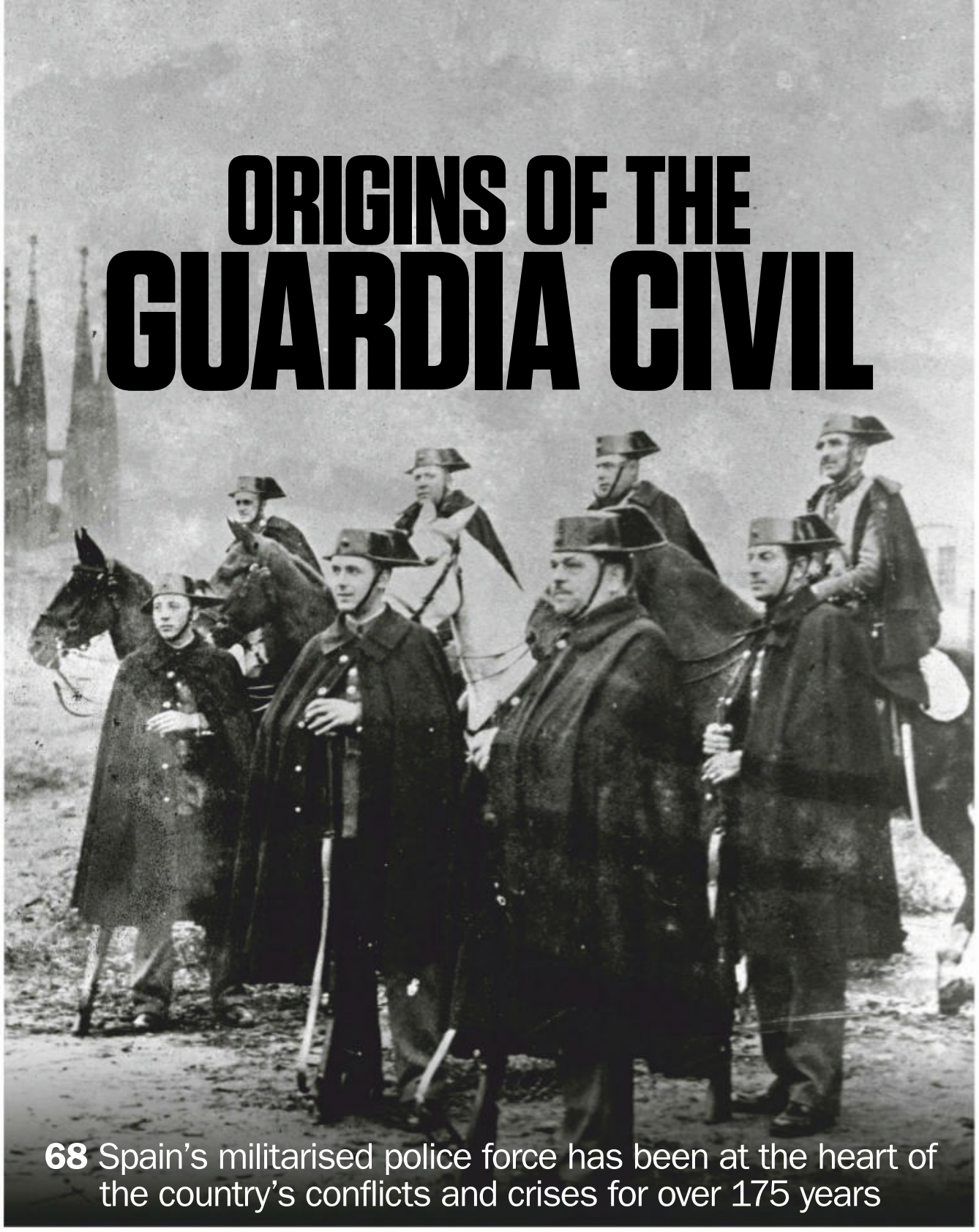
CORSAIRS AND KAMIKAZES

72 Fleet Air Arm veteran Keith Quilter discusses his experiences aboard HMS Formidable in 1945



ORIGINS OF THE GUARDIA CIVIL

68 Spain's militarised police force has been at the heart of the country's conflicts and crises for over 175 years

Great Battles

GOLAN HEIGHTS

56 British and Soviet armour designs are put to the ultimate test in this destructive Yom Kippur War clash

WAR in FOCUS

INSPECTING BRITISH PANZERS

Taken: ***18 May, 1937***

German War Minister and Commander-in-Chief, Field Marshall Werner von Blomberg, inspects British tanks during a visit to the Royal Tank Corps at Bovington Camp, Dorset, England. The following year Blomberg was ousted from power by his rivals in high command, and the Ministry of War was incorporated into the new Oberkommando der Wehrmacht.

Image: Getty


ROAST
BEEF
ROAST
BEEF
ROAST
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WAR in FOCUS

A CENTURY OF ARMOUR

Taken: ***15 September, 2016***

A British Army photographer takes a photograph of a Mark IV replica on display in Trafalgar Square, London. The full-size and working replica, called 'Big Brute', was built for the 2011 film *Warhorse*. In 2016 it appeared in the capital alongside a Challenger 2 tank, to commemorate the centenary of the first ever deployment of tanks in battle, at the Somme in 1916.

Image: Getty

WAR in FOCUS

A 'TIGER' TANK?

Taken: ***1951***

American soldiers pose on a painted M46 Patton tank during the Korean War. Originally upgrading and replacing the lighter M26 Pershing tank, the M46 was itself quickly made obsolete by the gruelling conditions in Korea, resulting in the considerably heavier-armoured M48 Patton. The latter would go on to serve in the US military well into the 1960s.

Image: Getty

WAR in FOCUS

APPROACH TO BASRA

Taken: ***4 April, 2003***

A Challenger 2 of the Royal Scots Dragoon Guards reaches the outskirts of Basra, during the battle for Iraq's southern city in the 2003 invasion. British and American forces approached the city along what had become known as the 'Highway of Death', where Iraqi forces retreating from Kuwait in 1991 were attacked by coalition troops during Operation Desert Shield.

Image: Alamy

HOBART'S FUNNIES

Unusual tanks are developed by the British 79th Armoured Division for the planned invasion of Normandy. Based on Churchill or Sherman tanks, these armoured vehicles can – among other things – demolish concrete structures, fill trenches, lay matting and clear mines or barbed wire.

GREATEST TANKS

TIMELINE OF THE...

D-DAY TANK OPERATIONS

Armoured vehicles played a prominent role on 6 June 1944 with the Allies preparing specially modified tanks beforehand

March 1943-June 1944

DEVELOPING THE DD TANK

The Duplex Drive (DD) tank is an amphibious M4 Sherman tank. The Sherman is selected after years of experimentation with other armoured vehicles. As a "swimming" assault tank, the DD can be launched off landing craft. It is provided to American, British and Canadian tank battalions for D-Day.

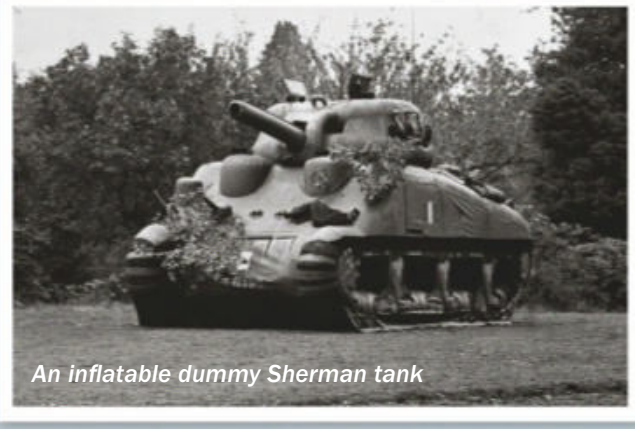
Nicknamed "Donald Duck" tanks, the DD can move in water with its gun ready to fire as soon as land is reached

Image: USMC Archives

April 1943-June 1944

OPERATION FORTITUDE

Fortitude is the deception strategy during the build up to the Normandy landings. Phantom field armies are created in Scotland and the south of England, which include inflatable decoy tanks. The "dummies" convince the Germans that the Allies have more tanks than they actually have.

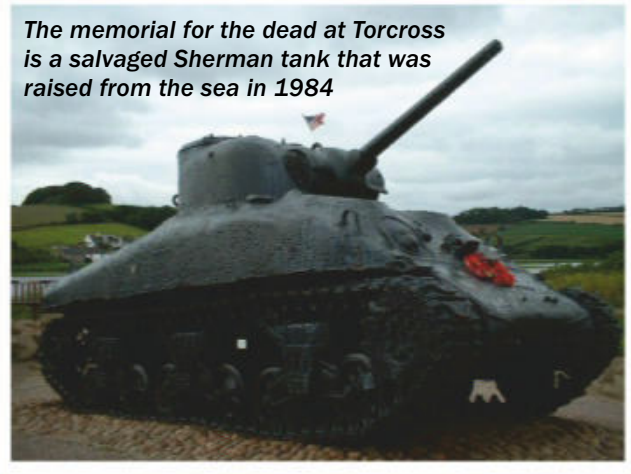


An inflatable dummy Sherman tank

December 1943-March 1944

April 1944

The memorial for the dead at Torcross is a salvaged Sherman tank that was raised from the sea in 1984



EXERCISE TIGER

D-Day rehearsals take place on Slapton Sands, Devon. The exercises are stained by tragedy when 749 American servicemen are killed by German E-boats in Lyme Bay, while on tank-landing vessels.

Image: Archangel12

Churchill AVRE tanks are designed to attack German defensive positions. "Funnies" like this are named after Major General Percy Hobart, the commander of 79th Armoured Division

GERMAN ARMOUR DISTRIBUTIONS

Just ten Panzer divisions make up the German defence of France. The thinly spread armoured forces means that only elements of the 21st Panzer Division at Caen is immediately available to counterattack an Allied assault on Normandy.

Erwin Rommel inspects troops of the 21st Panzer Division in France, May 1944

Image: Bundesarchiv, Bild 101I-300-1865-06 / Speck / CC-BY-SA 3.0

May 1944 — **Early 1944** — **6 June 1944**

Sherman tanks of 50th (Northumbrian) Infantry Division drive ashore from landing craft at Hayling Island, 6 May 1944

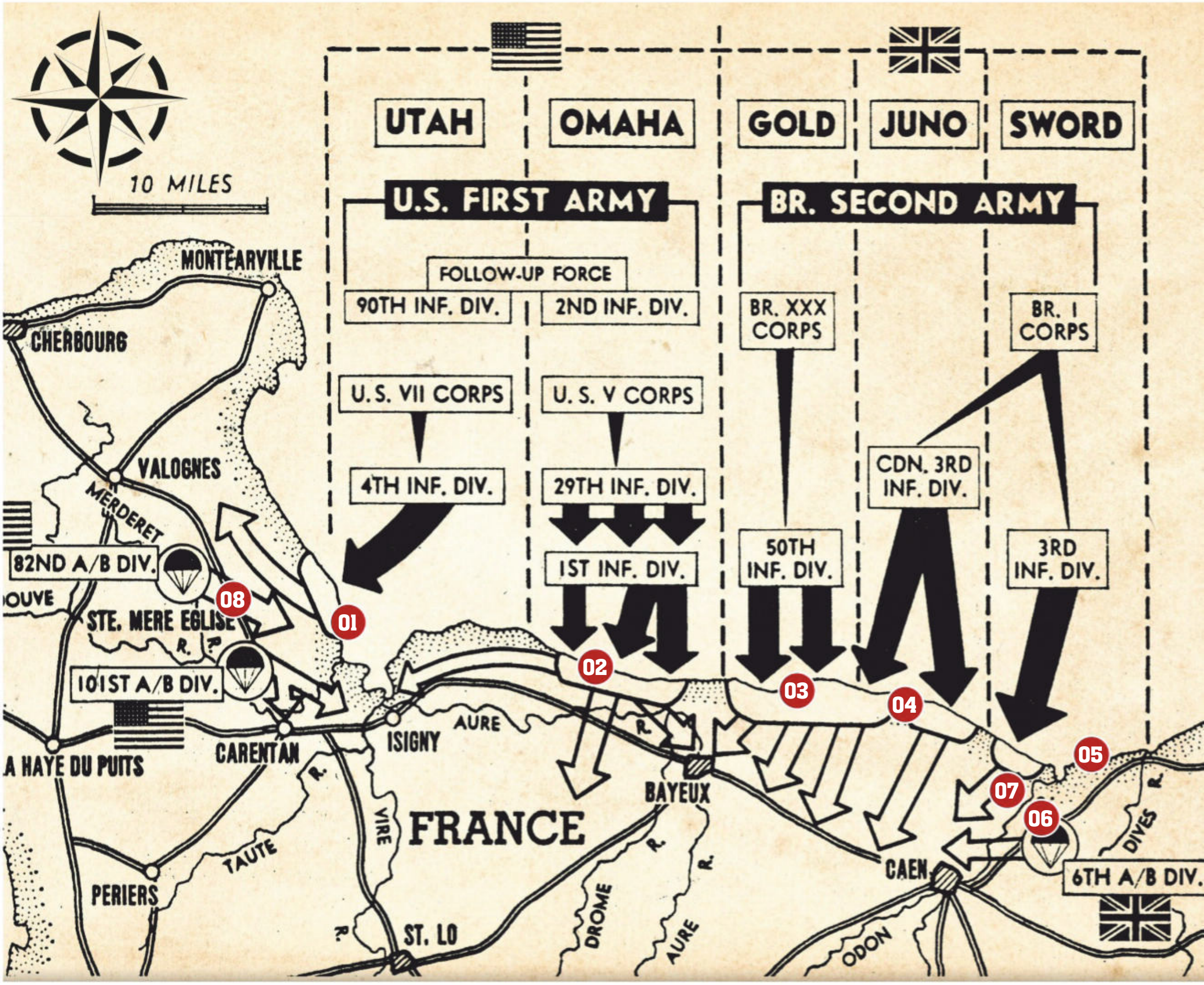
EXERCISE FABIUS

Fabius consists of six exercises for Operation Neptune at coastal locations in Devon, Hampshire and West Sussex. It is the largest amphibious training exercise of WWII and includes mechanised regiments among infantry divisions.

A stranded Sherman nicknamed "Cannon Ball" on Utah Beach. Note the special air intakes for semi-submerged landing

01 UTAH BEACH

DD tanks are operated by the US 70th Tank Battalion; 27 out of 28 reach the beach but a large smoke screen sees them land 1,829 metres from their aiming point. The tanks encounter congestion and some German opposition where several Shermans are knocked out.



6 June 1944

02 OMAHA BEACH

The first wave of landings at Omaha includes 112 tanks from the US 741st and 743rd Tank Battalions. Many of the DD tanks are sunk in bad weather conditions in swells that are up to six feet high. Most of the crews are rescued by landing craft.

Tanks of Company A, 741st Tank Battalion load aboard an LCT before departing for Omaha

03 GOLD BEACH

British tanks land in rough seas with some being launched 640 metres from the shore. German antitank guns cause heavy losses in some sectors but Sherman Crab tanks destroy enemy artillery and machine gun positions.

04 JUNO BEACH

The Canadian-dominated landing zone sees 21 out of 29 DD tanks reaching the beach. They fire on pillboxes as well as decimate strong points before moving south to Beny-sur-Mer and Anguerny.

***Left:** USS LST-21 unloads British tanks and trucks onto a 'Rhino' barge during the early hours of the landings at Gold*

This crossing at Bénouville that 21st Panzer Division attempts to retake becomes better known as "Pegasus Bridge"

06 OPERATION DEADSTICK

British paratroopers aim to capture two vital road bridges across the River Orne and Caen Canal. The bridges are captured but elements of the 21st Panzer Division move to retake them. Out of the 17 tanks sent through to the bridge 13 are destroyed and the British are reinforced.

07 OPERATION MALLARD

Mallard is an airborne operation that aims to airlift glider infantry and divisional troops to reinforce the left flank of the British invasion beaches. The landings include the first Tetrarch tanks to be delivered into combat by air.

Hamilcar gliders of 6th Airlanding Brigade arrive in a drop zone near Ranville loaded with Tetrarch tanks

"MALLARD IS AN AIRBORNE OPERATION THAT AIMS TO AIRLIFT GLIDER INFANTRY AND DIVISIONAL TROOPS TO REINFORCE THE LEFT FLANK OF THE BRITISH INVASION BEACHES"

Images: Alamy, Getty

6 June 1944

05 SWORD BEACH

The sea is reasonably calm at Sword although British DD tanks are launched four kilometres from the shore. The 27th Armoured Brigade leads the armoured assault and encounters dozens of Panzer IVs on the road to Caen.

Tanks of the Royal Hussars advance with No. 4 Commando towards Ouistreham

GERMAN COUNTERATTACKS

The 21st Panzer Division not only attempts to win back the bridges at Ranville and Bénouville but it also counterattacks the British on the west side of the Orne River. Parts of 192nd Panzer Regiment breaks through to the coast but it is halted. The regiment loses 25 per cent of its armour and fights its way back to Caen.

A Panzer IV, similar to the ones that are sent to recapture the Caen Canal bridge

Bundesarchiv, Bild 101I-298-1761-16 / Scheck / CC-BY-SA 3.0

The Germans attack Sainte-Mère-Église using converted French Renault R35 light tanks

08 ATTACK AT SAINTE-MERE-ÉGLISE

While supporting a counterattack, German tanks penetrate an American paratrooper post at Sainte-Mère-Église. The attack fails when the tanks are destroyed by bazooka fire.

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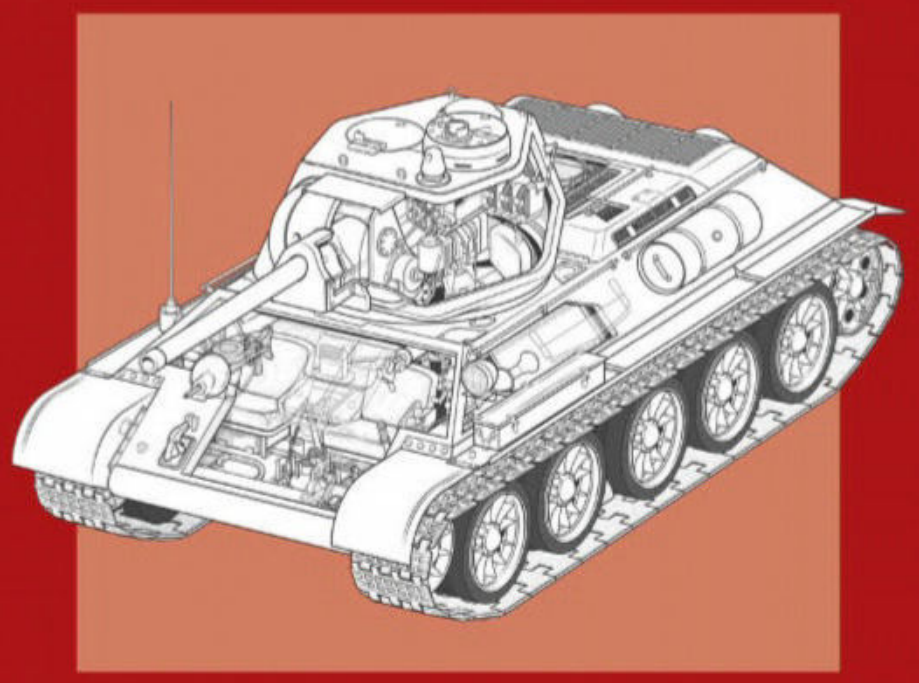

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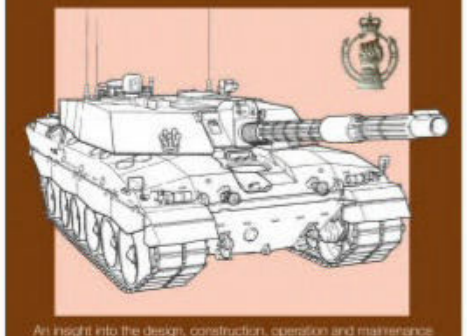

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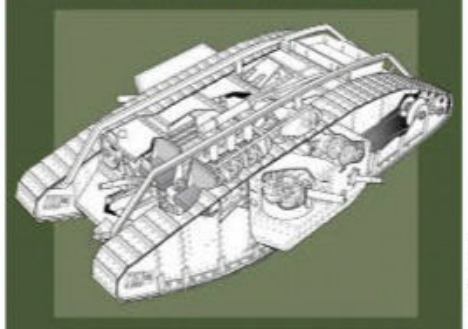

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Frontline

WHERE WERE THE US TANKS?

GREATEST TANKS

The operation to save Europe from occupation began on the beaches of Normandy – but Allied armour was not a resounding success on every landing

Germany First! This was the strategy agreed between Great Britain and the United States during the Second World War. Ever since Dunkirk the British had been aiming at getting back to the continent by one means or another. This idea was well understood in the UK, even in 1940 there were plans to return, for example one officer in September 1940 suggested the forming of Air-Mobile Divisions carried by helicopter for a return to Europe in 1941. There were also discussions about amphibious tanks for any potential landing operation. These deliberations would result in the Duplex Drive tanks used on D-Day. Indeed a great many of the technologies the British developed during the Second World War were used to create the successful landings as part of Operation Neptune.

When the leading waves of troops surged ashore on 6 June, the most imaginative defences one could devise with steel and concrete met the assault waves. To overcome them equally ingenious creations had been fitted to tanks the allies landed – these were dubbed "the Funnies" due to their outlandish appearances. If these vehicles failed to overcome the defences, then the casualties would be enormous, and the allies would never get another chance at a landing of this scale.

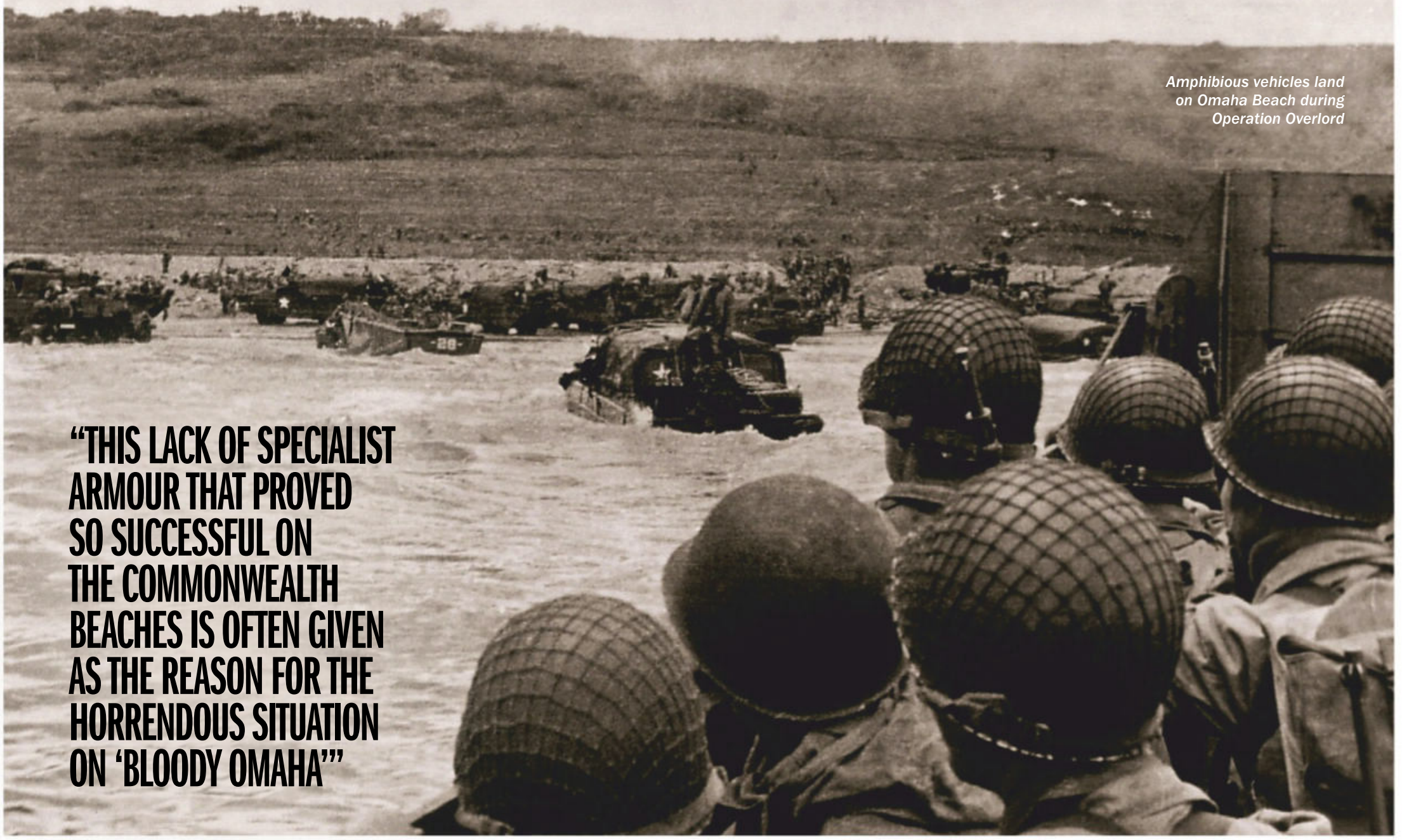
At Omaha Beach, however, US soldiers took monstrous casualties from enemy fire. So where were the tanks? The US army had been offered the services of the Funnies but had refused. This decision has come in for quite some criticism by historians over the years, and this lack of specialist armour that proved so successful on the Commonwealth beaches is often given as the reason for the horrendous situation on "Bloody Omaha".

It's important to remember most of these designs were on British hulls, which would have meant bringing new logistics into the army, which includes spares and training. Equally the British could not produce enough tanks for both armies. There had been attempts to create some Funnies on Sherman hulls, such as the Sherman Crocodile that was designed and built towards the end of 1943. However, for some unknown reason, this tank was limited to four prototypes, and not deployed until well after D-Day.

One of the Funnies deployed at Omaha was the Sherman DD. These swimming tanks were arranged to land but were thwarted by the conditions. The tanks assigned to Utah drove straight in, keeping their sterns towards the waves, and landed intact, albeit later than planned. At Omaha, the tanks used the tower of Church of Colleville sur Mer as an aiming point for their landings. As they were swept along this meant they began to turn, and when broadside onto the crashing waves their flotation screens were smashed down, and the tanks foundered.

Despite this disaster at Omaha, elsewhere the Funnies played their role effectively. Without them, the shape of the modern world could have been massively altered – perhaps the resources freed from this front could have changed the progress of the Eastern Front, or even if they did not, then where would the Iron Curtain have fallen in the post-war world? Without the liberation of France, maybe along the English Channel? Would the Soviet Union's Operation Bagration have been so successful without the crucial second front in France to distract Germany's resources? The shape of our current world was in the balance, and it all came down to this one day and a handful of peculiar looking tanks.

Images: Alamy



Amphibious vehicles land on Omaha Beach during Operation Overlord

"THIS LACK OF SPECIALIST ARMOUR THAT PROVED SO SUCCESSFUL ON THE COMMONWEALTH BEACHES IS OFTEN GIVEN AS THE REASON FOR THE HORRENDOUS SITUATION ON 'BLOODY OMAHA'"

GREATEST TANKS

6 JUNE ARMOUR

A few odd machines fought for the future of Europe during one of its most important battles

On 6 June, and during the days afterwards, two armies grappled with all their might, including armoured vehicles. Both sides were using odd-looking tanks. The allies had modified their front line tanks to ensure success and even the odds, while the Germans were using old captured machines, some of which had been modified as well. This meant that D-Day could be called the battle of the Funnies, as both sides employed unusual machines.

Above: A Centaur IV of the Royal Marine Support Group, shown towing an ammunition sled

50 GREATEST TANKS

CENTAUR
COMMISSIONED: 1943
ORIGIN: BRITISH
LENGTH: 20FT 10in (6.35m)
RANGE: 165 miles
ENGINE: NUFFIELD LIBERTY V12 MARK V, PETROL **CREW:** 4
ARMOUR: 76mm
PRIMARY WEAPON: 1x 94mm ORDNANCE QF '95-mm' HOWITZER
SECONDARY WEAPON: 1x 7.92mm X57 BESA MACHINE GUN

CENTAUR
A DISPOSABLE TANK THAT WENT THE DISTANCE

As the invasion's landing craft approached the beaches, their covering fire from distant warships would lift. In the minutes after this support fire ceased, but before the tanks could unload and provide direct fire, the landing craft were exposed to enemy action with no means of reply. To this end some solutions were arranged, such as mounting guns on to landing craft. Another quick and easy suggestion was to place tanks inside a standard landing craft, fitting these with raised ramps in place near the front, to accommodate a pair of tanks positioned forward-facing.

The tanks chosen for this endeavour were old A27L Centaurs. It was proposed to entirely remove the Nuffield Liberty engines, which had caused many problems during the development of the Centaur. This space could be filled with more ammunition for the main gun, allowing the vehicles to keep firing after the landing craft had beached itself and be used in direct fire support roles. However, another view was, as the navy had gone to all this trouble of delivering the tanks, they might as well keep their engines and be used on the beaches. The machines were considered disposable, so were issued to the Royal Marines, who created the RM Armoured Support Group (RMASG).

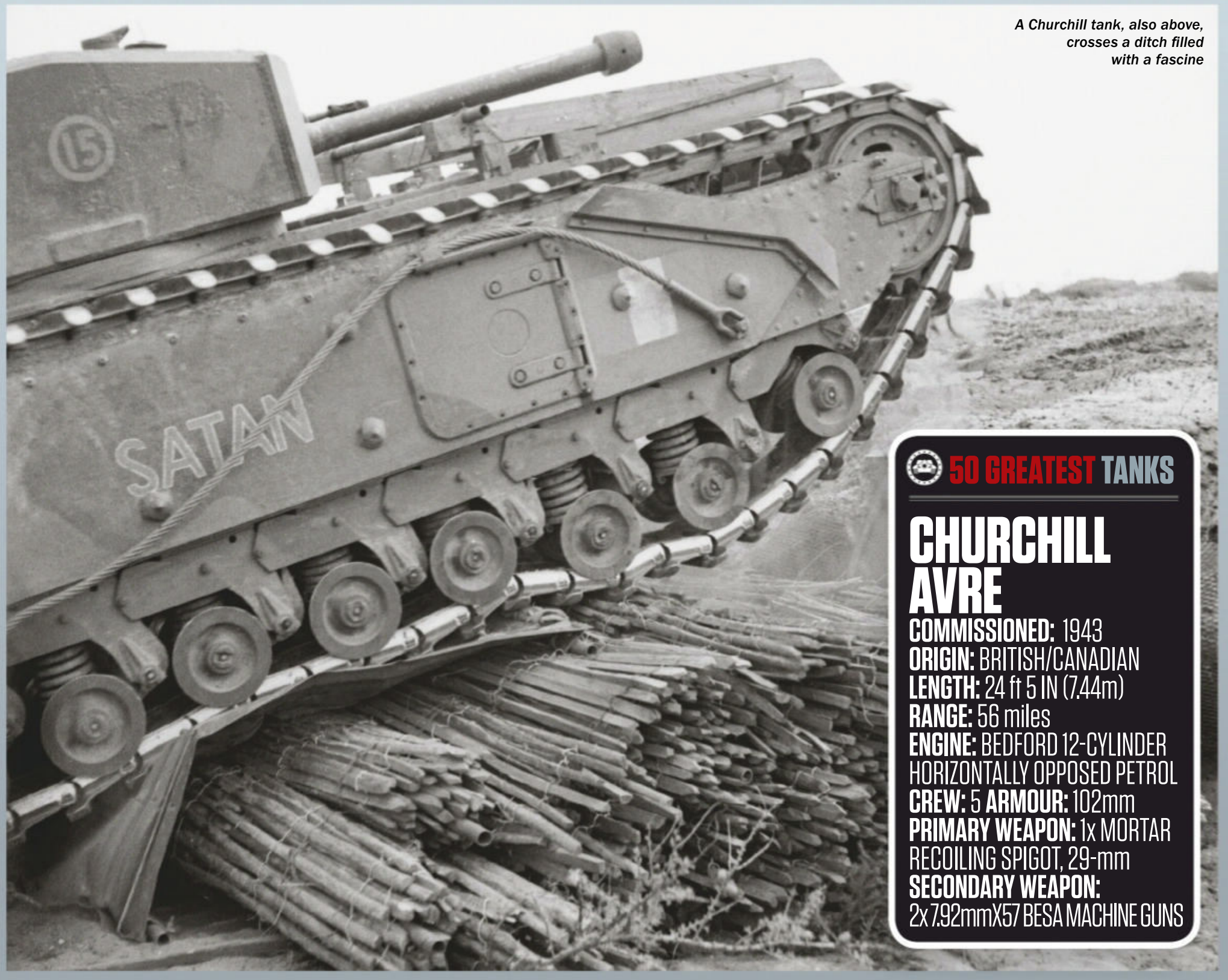
In this role they served for some two weeks before being handed to the Royal Artillery for a period, and then finally being given to the fledgling French forces.

CHURCHILL AVRE
THE ARMOURED SWISS ARMY KNIFE

The development of the AVRE was driven by the Canadians, who had suffered greatly during the 1942 Dieppe Raid. This work started in October 1942. In February 1943 two tanks were trialled at Hankley Common. One of these was fitted out as a sapper vehicle, able to carry the sappers and their supplies, and had an erectable bullet-proof screen enabling the engineers to exit the vehicle and work under fire. The other was armed with a recoiling spigot launcher named a Petard. It lobbed a huge 40lb HESH projectile, which was ideally suited to destroying concrete. After a successful demonstration, the two designs were combined, although the final version lost the erectable screen. Arguably more than any other it was this tank that was the most crucial to breaching the Atlantic wall.

One such demonstration of the power of the Petard was on Gold Beach. In the afternoon the 1st Battalion Royal Hampshire Regiment was still battling to clear Le Hamel, which was the site of two strong points. One of these was set in the old sanatorium, the other, just next door, was a German bunker that had a 75mm gun in it, which was able to sweep the length of Gold Beach with enfilading fire. During the day it had claimed several tanks and landing craft. The 1st Hampshires were just unable to make any headway against this concrete monstrosity. An attempt to close with the bunker and destroy it started at 1345, but after an hour they had only advanced 200 yards. Then a lone AVRE from 82nd Assault Squadron, Royal Engineers appeared. Its first round shattered the bunker with the 75mm, Then a few shots into the sanatorium cracked the bunker wide open, and shocked the Germans so much their fire slackened. Seizing on this opportunity, the 1st Hampshires swarmed forward and assaulted the sanatorium with hand grenades. Within minutes the strongpoint was captured, and Jig Sector, Gold Beach was open for business.

"ARGUABLY MORE THAN ANY OTHER IT WAS THIS TANK THAT WAS THE MOST CRUCIAL TO BREACHING THE ATLANTIC WALL"



A Churchill tank, also above, crosses a ditch filled with a fascine

50 GREATEST TANKS

CHURCHILL AVRE

COMMISSIONED: 1943
ORIGIN: BRITISH/CANADIAN
LENGTH: 24 ft 5 IN (7.44m)
RANGE: 56 miles
ENGINE: BEDFORD 12-CYLINDER HORIZONTALLY OPPOSED PETROL
CREW: 5 **ARMOUR:** 102mm
PRIMARY WEAPON: 1x MORTAR RECOILING SPIGOT, 29-mm
SECONDARY WEAPON: 2x 7.92mmX57 BESA MACHINE GUNS

SHERMAN CRAB
FLOGGING THEIR WAY TO VICTORY

It was expected that during Operation Overlord the Germans would undoubtedly make extensive use of mines, and any landing was going to land directly into a dense minefield. A way through the mines was needed to prevent the invasion stalling on the beaches and being obliterated.

The most successful mine-clearing designs that had been developed in 1944 were flail tanks. These thrashed the ground in front of the tank with chains, which would impart the necessary force to trigger the mine, or the chain would strike the mine, smashing it to pieces without triggering an explosion. The act of failing was termed 'flogging' by the flail crews. The first flail tanks had been fitted with a separate engine, and some designs accepted the increase in these weight penalties, but it was much more common to remove the turret instead.

For Operation Overlord, Sherman tanks were fitted with flails to create the Sherman Crab. Unlike previous designs, the flails on these tanks were driven by a power take-off from the Sherman's engine. Three regiments of Sherman Crabs were provided for D-Day and despite losing many tanks to enemy fire, the tanks ripped huge lanes through the Germans' first defensive layer and allowed access for the attack to continue.

50 GREATEST TANKS

SHERMAN CRAB
COMMISSIONED: 1942 **ORIGIN:** BRITISH
LENGTH: 27ft (8.23m) **RANGE:** 39 miles
ENGINE: CHRYSLER A57 MULTIBANK
CREW: 5 **ARMOUR:** 50mm
PRIMARY WEAPON: 1x 75 MM L/40 M3 GUN **SECONDARY WEAPON:** 1x .30 BROWNING M1919A4

Sherman tanks were outfitted with flails to clear a path through minefields

PANZERKAMPFWAGEN 35R 731 (F)
A PRACTICAL FRENCH DESIGN, PRESSED INTO GERMAN SERVICE

After the surrender of France in 1940 the Germans found themselves in possession of a large number of ex-French equipment. Among this haul were about 850 Renault R-35s. In German service they were called the Panzerkampfwagen 35R 731 (f). Throughout the Second World War these little tanks would be converted to many roles.

A significant number were used as tanks, retaining their usual 37mm L/21 SA18 gun, although the Germans usually cut off the commander's observation dome and replaced it with a traditional cupola. In this guise the tanks served as internal security vehicles as well as crew training. Around 19 Panzer 731(f)s were issued to Ersatz Panzer Abteilung 100, which was based on the Cherbourg peninsula on D-Day.

It was Pz.Abt.100 that was one of the few mobile forces available to the Germans to face the initial Allied invasion. The tanks of this unit were thrown at the US paratroopers around St Mère Église. On 6 June at the La Fière Bridge, Two Panzer 731(f)s and a Panzer III attacked, trying to break the position, but a six-pounder and bazookas quickly destroyed them. Later on during another attack, a Panzer 731(f) managed to get into St Mère Église and shoot up the US Paras' headquarters before being knocked out by a bazooka.

"IT WAS PZ.ABT.100 THAT WAS ONE OF THE FEW MOBILE FORCES AVAILABLE TO THE GERMANS TO FACE THE INITIAL ALLIED INVASION"

***Right:** The Germans refitted French tanks for their own purpose*

50 GREATEST TANKS

PANZERKAMPFWAGEN 35R 731 (F)
COMMISSIONED: 1940 **ORIGIN:** FRENCH
LENGTH: 13ft 2IN (4.02m) **RANGE:** 80.77 miles
ENGINE: RENAULT V-4 GASOLINE ENGINE
CREW: 5 **ARMOUR:** 43mm **PRIMARY WEAPON:** 1x 37 mm L/21 SA 18 GUN **SECONDARY WEAPON:** 1X 7.5 mm MAC31 REIBEL MACHINE GUN

A17 TETRARCH
THE LAST BATTLE OF A PRE-WAR FAILURE

In 1937 Leslie Little took over the role as chief engineer at Vickers. His first piece of work was a new suspension type. This was to be fitted to a light tank with a 14mm basis of armour, named the Purdah. Vickers approached the War Office with the Purdah and made some remarkable claims about the new suspension, saying it had a quarter of the rolling resistance of conventional suspension. This, in turn, would allow a smaller engine, and thus save weight.

The War Office was sceptical and considered the 14mm armour to be insufficient and rejected the Purdah. Vickers decided to develop the Purdah as a commercial venture. In May 1938 Vickers had completed the tank, and once again approached the War Office. The War Office was now willing to accept any armoured vehicle, officially calling the tank the A.17 Tetrarch.

The Tetrarch was used for the airborne landings because no other tank was light enough. About 20 A.17s were formed into the 6th Airborne Armoured Reconnaissance Regiment. On the morning of 7 June, at about 9.30am, a recce patrol with at least one Tetrarch and a Jeep were probing forwards. They ran into a German armoured car. The German vehicle opened fire setting the jeep on fire. In return the Tetrarch destroyed the German armoured car. The A.17s stayed in combat for some ten days, at which time the crews were withdrawn and re-equipped with Cromwell tanks.

The A.17 Tetrarch was initially rejected by the War Office over concerns on its light armour

"THE TETRARCH WAS USED FOR THE AIRBORNE LANDINGS BECAUSE NO OTHER TANK WAS LIGHT ENOUGH. ABOUT 20 A.17S WERE FORMED INTO THE 6TH AIRBORNE ARMOURED RESONANCE REGIMENT"

50 GREATEST TANKS

A17 TETRARCH

COMMISSIONED: 1938
ORIGIN: BRITISH **LENGTH:** 13ft 6in (4.11m) **RANGE:** 140 miles
ENGINE: MEADOWS 12-CYLINDER
CREW: 3 **ARMOUR:** 14mm
PRIMARY WEAPON: 1x 40mm 2-POUNDER
SECONDARY WEAPON: 1x 7.92mmX57 BESA MACHINE GUN

Images: Alamy, Getty

GREATEST TANKS

COMMANDERS & DESIGNERS

Innovative individuals designed special armoured vehicles to face the determined, yet outnumbered, Panzer formations at Normandy

SIR PERCY HOBART
THE VETERAN TANK ADVOCATE WHO DEVELOPED THE FAMOUS "FUNNIES"
1885-1957
MAJOR GENERAL UNITED KINGDOM

Hobart was originally a Royal Engineers officer who fought in France and Mesopotamia during WWI. His experiences led him to believe that tanks were the future of ground warfare and he joined the newly formed Royal Tanks Corps in 1923. Rising to the rank of colonel in 1928, Hobart created and commanded the 1st Tank Brigade in 1934, while developing new tactics in the context of mobile warfare.

In 1937, Hobart was promoted to major general but he was often at odds with the British military establishment who transferred him to Egypt the following year. In North Africa, Hobart raised and trained the nucleus of the future 7th Armoured Division (the "Desert Rats") but he was taken off duty in 1939. He even served as a corporal in his local Home Guard unit. Prime Minister Winston Churchill eventually recalled him for service and this time Hobart raised and commanded the 79th Armoured Division.

In this position, Hobart was given the responsibility to develop armoured equipment and tactics that would perform specialised tasks to support ground troops for the Normandy landings. The resulting innovations improved on existing designs, and entirely new technologies were created for what became known as "Hobart's Funnies". These various designs were ingeniously practical and the 79th Armoured Division proved to be a key element in swiftly breaching the Atlantic Wall on 6 June 1944.

A Churchill tank of 79th Armoured Division uses a Churchill Ark to scale a sea wall during trials near Saxmundham, 11 March 1944

***Left:** After his retirement from the British Army in 1946, Hobart became the lieutenant-governor of the Royal Hospital, Chelsea*

EDGAR FEUCHTINGER
THE COMMANDER OF THE 21ST PANZER DIVISION IN NORMANDY 1894-1960
LIEUTENANT GENERAL GERMAN REICH

Feuchtinger had fought as a lieutenant during WWI in both France and Russia and remained in the Reichswehr after the Armistice. He commanded an artillery regiment during the early years of WWII but became a Panzer commander in 1943 despite having no experience with tanks.

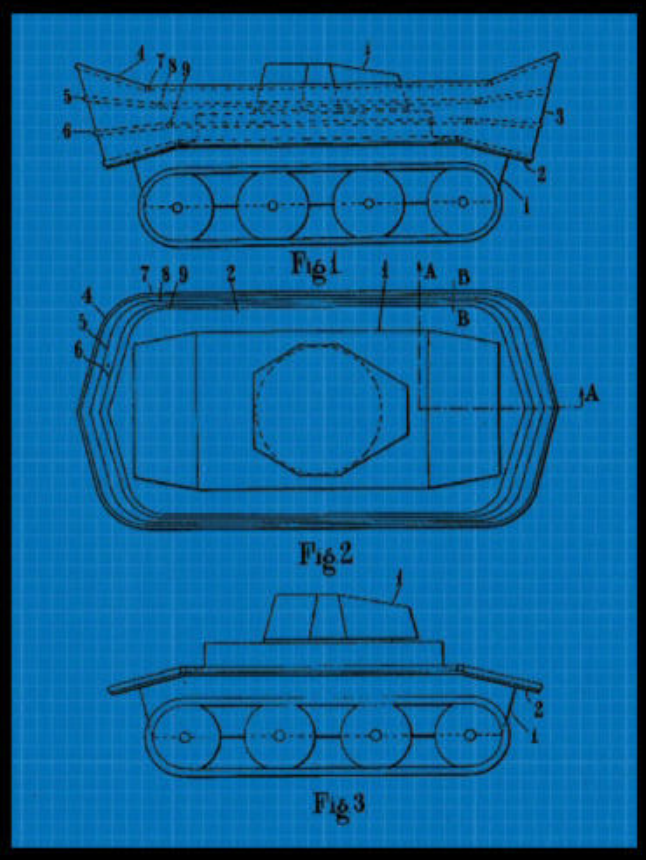
By May 1944, Feuchtinger was now commanding the reformed 21st Panzer Division in Normandy but he spent much of his time in Paris. One of the reasons for his absence was that the French capital was the residence of his actress girlfriend and he was with her when the Allies invaded.

In the first 72 hours from 6 June, Feuchtinger delegated the execution of orders to his more experienced commanders but this caused confusion and delays at a critical time. The 21st Panzer Division consequently remained mostly inactive against the Allies during the early stages of the invasion. Feuchtinger, who largely owed his position to Nazi Party connections, has since been assessed by historians to have "lost the day for the Germans" and is regarded as "one of the least qualified and least successful of the German tank commanders."

After Normandy the Nazis convicted Feuchtinger of treason but his sentence of death was commuted by the intervention of Adolf Hitler

Bundesarchiv, Bild 101I-/ / CC-BY-SA 3.0

After D-Day, Straussler also adapted the Duplex Drive for Churchill, Cromwell and Centurion tanks



NICHOLAS STRAUSSLER

THE HUNGARIAN INVENTOR OF THE DD TANK 1891-1966 UNITED KINGDOM

Born in Hungary, Straussler gained a reputation for automotive engineering before he became a British citizen in 1933. He designed armoured cars for Alvis and Vickers Armstrong before WWII and the Hungarian Light Tank V4 was built based on his design. Straussler was also responsible for the Alvis Straussler Bomb Trolley, which transported munitions around RAF airfields.

His most famous design was the Duplex Drive (DD) tank, which was overseen by the British War Office. From 1941, Straussler experimented on various tanks to make them successfully float. He devised a flotation screen, which was a folding canvas that wrapped around the vehicle. Horizontal metal hoops and vertical rubber tubes that filled with compressed air supported this. Mobility was unimpeded and DD tanks were even fitted with a propeller that was powered by the engine.

The M4 Sherman was ultimately chosen for the DD tank and they were launched from special landing crafts two miles from shore. Although they performed disastrously at Omaha Beach, Straussler's invention fared better on the other beaches.

THEODORE ROOSEVELT JR.

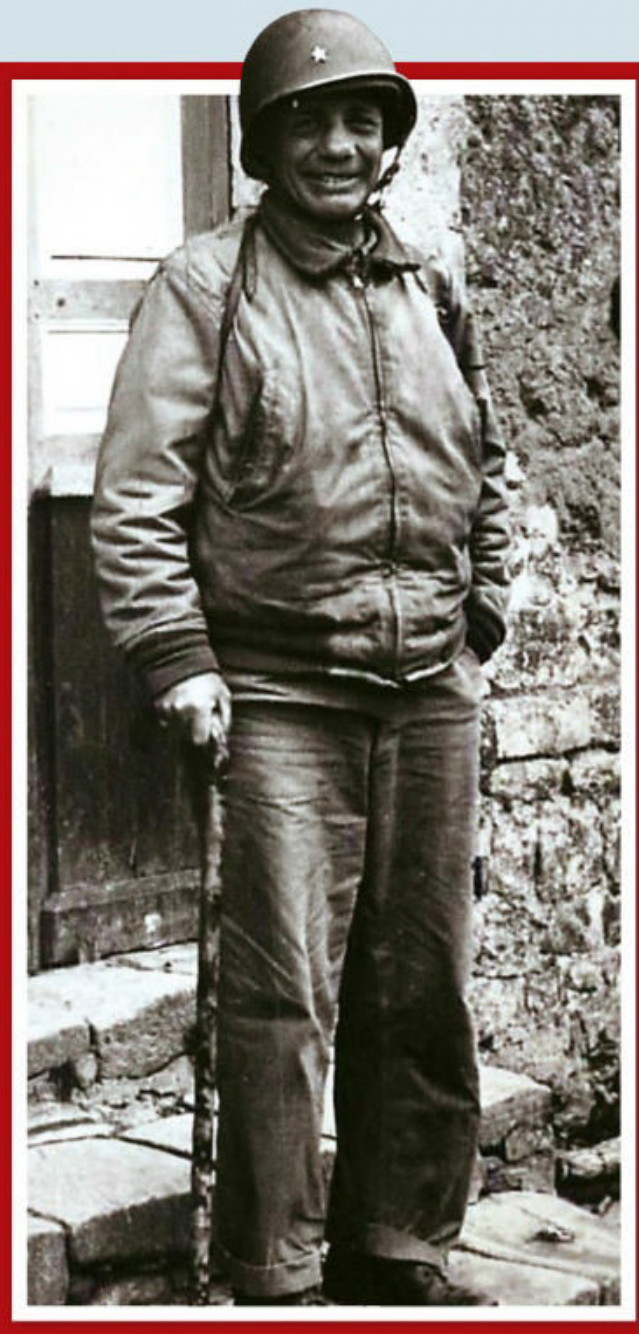
THE PRESIDENT'S SON WHO COURAGEOUSLY LED TANKS AND MEN ASHORE ON UTAH BEACH 1887-1944 BRIGADIER GENERAL UNITED STATES

The eldest son of President Theodore Roosevelt, Roosevelt Jr. saw combat service during WWI and was instrumental in forming the American Legion. During the interwar period, he was a successful politician and businessman before he resumed his military career in 1941 and became a brigadier general.

On 6 June 1944, Roosevelt led the first American troops ashore on Utah Beach. At 56, he was the oldest man in the invasion and the only general on the beach. Leading 70th Tank Battalion and 8th Infantry Regiment, Roosevelt landed armed with a cane and pistol. When he was informed that the landing craft had drifted south from their objective he famously declared, "We'll start the war from right here!"

Roosevelt personally untangled traffic jams of tanks and trucks to get off the beach and welcomed every landing regiment while ignoring nearby exploding shells. Utah was a successful operation but Roosevelt died of a heart attack in Normandy only a few weeks later. He was posthumously awarded the Medal of Honor.

General of the Army Omar Bradley later commented that "Ted Roosevelt on Utah Beach" was the most heroic action he had ever seen in combat



"ON 6 JUNE 1944, ROOSEVELT LED THE FIRST AMERICAN TROOPS ASHORE ON UTAH BEACH. AT 56, HE WAS THE OLDEST MAN IN THE INVASION AND THE ONLY GENERAL ON THE BEACH"

Images: Alamy

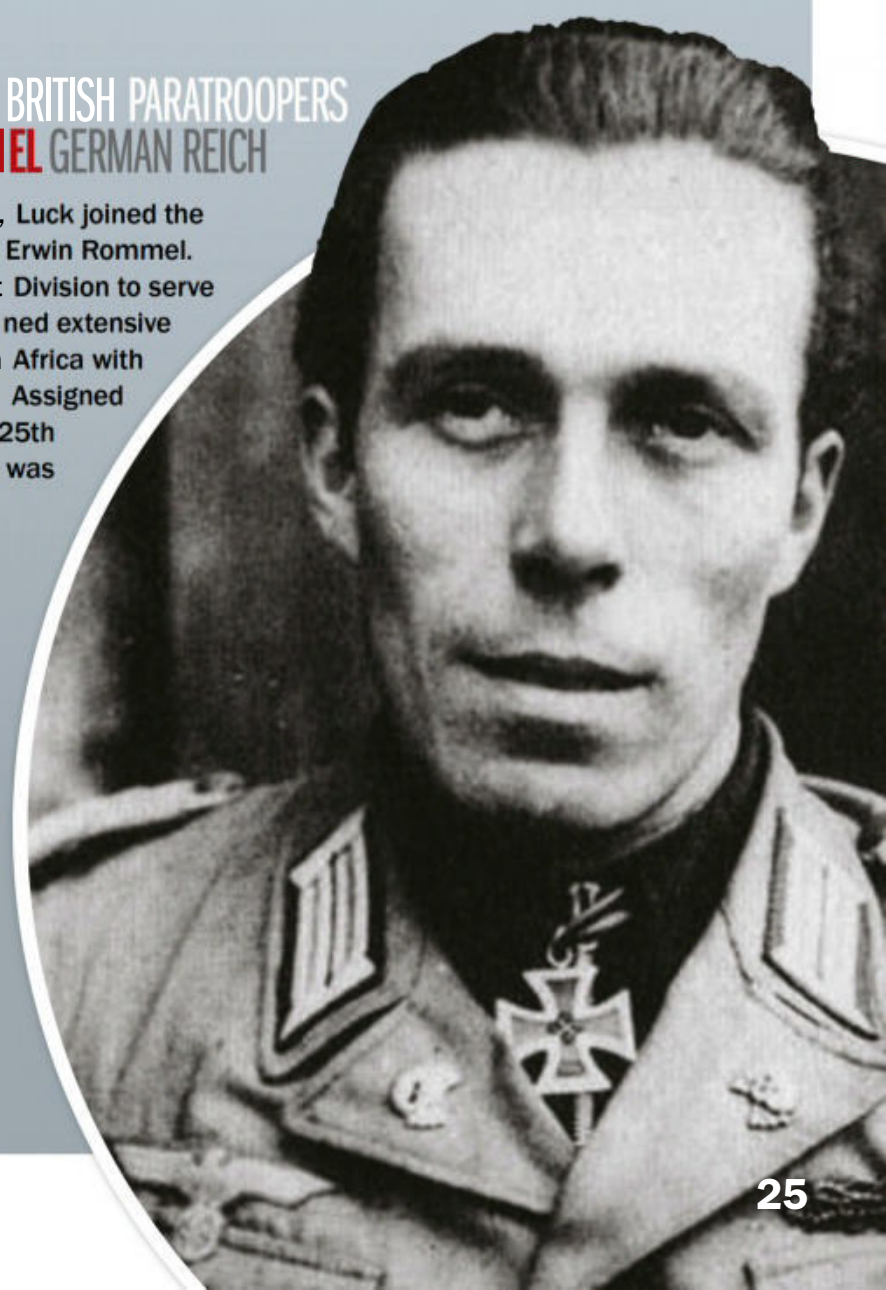
HANS VON LUCK

THE PANZER COMMANDER WHO ATTACKED BRITISH PARATROOPERS ON THE ORNE BRIDGES 1911-1997 COLONEL GERMAN REICH

Born into an established Prussian military family, Luck joined the Reichswehr in 1929 and was partially trained by Erwin Rommel. Ten years later, Luck was posted to the 2nd Light Division to serve in its armoured reconnaissance battalion. He gained extensive fighting experiences in Eastern Europe and North Africa with Panzer divisions before he was posted to France. Assigned to the 21st Panzer Division, Luck commanded 125th Panzer Grenadier Regiment from May 1944 and was stationed southeast of Caen at Vimont.

On 6 June 1944, Luck's detachment was the only one from the division to attack incoming paratroopers east of the River Orne. At 5pm, Luck's armoured personnel carriers attempted to break through the bridges at Bénouville but heavy fire from ships supporting the defending British paratroopers drove the Germans back. More paratroopers also landed in the rear, which caused more of Luck's forces to retreat. Nevertheless, the German failure lay not with Luck, but the inflexibility of his superiors to attack sooner.

Luck survived the war and became good friends with his former British adversaries. He lectured at military schools and wrote a book called Panzer Commander



GREATEST TANKS

RUSSIA

WORDS **MARK HEALY**

Since the 1930s through to the present day, tank development and production in the former Soviet Union, and now Russia, has never ceased in the ongoing competition with the western powers

No country has created a greater range of tanks, or produced so many since 1930, as the Soviet Union – this being continued under Russia, its successor state. By the time of the German invasion in June 1941, the Red Army tank park was larger than the rest of the world's put together.

Although the majority of the 24,000 tanks in service were destroyed in that year, there were already in service advanced medium and heavy tanks superior to any fielded by the Wehrmacht. The T-34 became the mainstay of the tank forces, with the heavy KV series, while not lasting so long, laying the development foundations for the heavy tanks that came after. Post-war Soviet tank development continued at a rate unmatched in the west. The export of thousands of tanks also became one of the primary instruments for securing client states in the 50-year Cold War. The latest innovation is to be seen in the T-15 Armata tank – claimed by the Russians to be best in the world.

A HIGHLY EFFECTIVE MAIN GUN

When first encountered in June 1941, the 76.2mm main armament of the T-34 could defeat any German tank. It took the Germans until the spring of 1942 to equip their Panzer IV and Assault Guns with more powerful guns that could defeat the T-34.

SLOPING ARMOUR

The T-34 was the first tank to go into large scale production with sloping armour which provided far more effective protection than implied just by its thickness. The 45mm armour of the glacis was equal to 90mm being angled at 60 degrees.

T-34 1940-PRESENT

This prolific machine was described by the British School of Tank Technology as "an engineering achievement of the first magnitude"

In all attempts to list the greatest tank ever built, the Soviet T-34 medium tank has invariably topped the list and for good reasons. When it entered service with the Red Army in 1940, it was in advance of the tanks of any other nation, as the Germans discovered to their cost when they invaded the Soviet Union in June 1941.

They had presumed that the Red Army had only the tanks with which they were already familiar. Weighing 28 tons, with wide tracks, sloped armour and armed with a 76.2 mm main gun, the T-34 rendered the main German medium tank, the Panzer III, technologically obsolete. The fact that the T-34 did not impact more on the enemy in the summer of 1941, despite some 1,500 entering service by this time, had much to do with the dire state of the Red Army during this period.

In the ferocious war that unfolded in the east, the T-34 emerged as one of the decisive weapons in the Soviet arsenal. Against the backdrop of tank factories evacuated to the east of the Urals, the T-34 was produced in the thousands and lost in the same number. It was only after the battle of Kursk in July 1943, when confronted with the new Panther and Tiger I, that Stalin permitted the T-34 to be updated wherein the earlier armament of a 76.2mm gun was replaced by an 85mm weapon in a three-man turret. This new variant was superior to the old and gave the Red Army a medium tank that was fast, reliable and well-armed enough to contend with their main German opponents.

Entering service in early 1944, this too was built in its thousands and total T-34 production of both variants amounted to at least 60,000 machines by war's end. After the conflict the T-34/85 was produced under licence in Poland and Czechoslovakia and exported to many of the USSR's Cold War client states, where it fought in many conflicts, including the 1956 and 1967 Arab-Israeli wars. In small numbers the tank has been spotted operating in the Syrian Civil War and Yemen.

"IN THE FEROCIOUS WAR THAT UNFOLDED IN THE EAST, THE T-34 EMERGED AS ONE OF THE DECISIVE WEAPONS IN THE SOVIET ARSENAL"

KV- I/II HEAVY TANKS 1940-1943

Heavy tanks named after the Soviet defence commissar Kliment Voroshilov

The Germans encountered these tough tanks within days of the invasion of Russia and they came as a shock. The KV-II soon disappeared from the battlefield, but the KV-1 continued in production until early 1943. It was followed by the KV-85 with a bigger gun and further heavy tank designs such as the IS-II.

50 GREATEST TANKS

KV- I/II

COMMISSIONED: 1939
WEIGHT: 47 TONS
RANGE: 140 miles **CREW:** 5
ENGINE: 12-CYLINDER DIESEL
ARMOUR: FRONT: 90mm SIDE: 75mm, REAR:70 mm
PRIMARY WEAPON: 76.2mm ZIS-5

Inset above, left: *A brand-new KV-1 being seen off by workers from the factory in which it was built. The factory building the KV was evacuated from Leningrad to east of the Urals in 1941*

A NEW TANK

The tracks carried on the T-34 were from the outset wider than those carried on the German panzers. The T-34 thus had a lower ground pressure, being better able to cope with mud and deep snow, whereas the panzers simply sank in both.

50 GREATEST TANKS

T-34

COMMISSIONED: 1939
HULL LENGTH: 6.10 METRES
RANGE: 290 miles
ENGINE: V-2-34 DIESEL, 500 HP
CREW: 4
ARMOUR: 47mm HULL FRONT, 60 mm HULL SIDES, 90mm TURRET FRONT
PRIMARY WEAPON: 1 x 85mm ZIS – S-53
SECONDARY WEAPON: 2 x 7.62mm DTM MG

Image: Osprey

T-72 1972-PRESENT

This tank has seen many conflicts due to its reasonable price and being extensively exported

Having its origin in the competition between different tank design bureaus within the USSR and the need for a cheaper and simpler machine than the T-64, the prototype of the T-72 emerged in 1968 with production beginning in 1972. Following trials with the Red Army, a modified variant, the Obiekt 172M became the first of a series of T-72 tanks that has resulted in some 25,000 of this type being produced, with the latest third generation known as the T-72B3 emerging in 2015. Armed with the same automatically loaded 125mm main gun as mounted on the T-64 and a new diesel engine, the reasonably priced T-72 has been exported extensively and been built under licence in a number of countries.

The T-72 has seen combat in many conflicts worldwide, with the most significant of these being and the Yugoslavian Civil War and the Gulf War in 1991, where it proved highly vulnerable. It has been extensively modernised and updated over the years, with heavier and updated armour, new ammunition and improvements to the engine. In its latest incarnations it was re-designated as the T-90 – the first Russian tank built since the fall of the USSR – this too has been sold overseas.

50 GREATEST TANKS

T-72
COMMISSIONED: 1967
WEIGHT: T-72A 41.5 TONS, T-72 BM 44.5 TONS
RANGE: 500km **CREW:** 3
ENGINE: T-72A, V-46-6, T-72 BM, V-84
ARMOUR: STEEL AND COMPOSITE ARMOUR
PRIMARY WEAPON: T-72M1 125mm D-81TM
SECONDARY WEAPON: EXTERNALLY MOUNTED 12.7mm NVST 'UTES' AA GUN

Inset, above: *A modernised third generation T-72 B3 on parade in Russia in the Moscow region in April 2017*

T-62 MEDIUM TANK 1965-PRESENT

The T-62 has a had a long career, mainly abroad – something not expected of it at the time of its first employment with the Red Army

During the Cold War the Soviet perception was that their current tanks – in the form of the T-54/55 series – were under-gunned compared with the new NATO types. This prompted demand for a new tank. A combination of factors led to the melding of a newly developed 115mm gun, in a new turret, on an elongated T-55 hull – the result was the T-62.

This was to emerge as the main tank of the Red Army in the late 1960s and 70s. When production ended in October 1973 19,019 T-62s had been built. It was in combat in the Yom Kippur War in 1973 and later in the 1980s also with the Iraqi Army in its war with Iran. The tank was extensively exported and is still seen in parades in North Korea.

50 GREATEST TANKS

T-62
COMMISSIONED: 1962
WEIGHT: 37.5 TONS
RANGE: 450km **CREW:** 4
ENGINE: V-55 580HP DIESEL
ARMOUR: (GLACIS) 100mm (TURRET) 230mm FRONT
PRIMARY WEAPON: US-TS(2A20) 115mm SMOOTH BORE
SECONDARY WEAPON: 1 X 7.62mm PKT, 1 X DSHKM 12.7 MG

Originally seen by the Red Army as a stop-gap, the T-62 has seen extensive combat in the Middle East and Asia

T-64
COMMISSIONED: 1955
WEIGHT: 42.2 TONS
RANGE: 600km **CREW:** 3
ENGINE: 5TDF DIESEL
ARMOUR: GLACIS 204mm LAMINATE ARMOUR
PRIMARY WEAPON: 1 x 125mm D-81TM **SECONDARY WEAPON:** 1 x 12.7 NVST MG

T-64 1964-PRESENT

The USSR's secret tank was an enigma to western intelligence agencies for many years

Only seen once in a Red Square parade and never exported, the T-64 was the USSR's most secret tank. Produced to an exacting and radical specification it had a long gestation, arising from its many new technologies. Initially armed with a 115mm gun, it later received a 125mm serviced by an automatic loader.

The T-64A was frequently modified and then replaced by the T-64B missile tank with the final model of the design appearing in 1983. This was fitted with External Reactive Armour (ERA) from 1985 onwards. Total production of the T-64 was 5,400. It first saw combat with the Ukrainian Army in 2014 where it proved vulnerable to RPG fire, but is still being updated by the Ukrainians.

T-64 tanks preparing to leave Hungary in 1989 to return to Russia with the end of the Cold War

T-80 1976-PRESENT

The last tank produced in the former Soviet Union was finally accepted for production in 1976, after a long gestation period

The last tank produced in the former Soviet Union, the T-80 was finally accepted for production in 1976 after a troubled development process. It was intended as the Soviet Army's standard tank and was powered by a gas turbine engine. The most common production model was the T-80B, which had been designed to fire the 9M112M Kobra missile from the barrel and entered service in the early 80s. From 1983 onwards it began to be fitted with Kontaket ERA to become the T-80BV. Trouble with the gas turbine led to it being fitted with a diesel engine to create the T-80U. Dropped after perceived failure in the Chechen war, the tank is still built in the Ukraine with the designation T-84.

"TROUBLE WITH THE GAS TURBINE LED TO IT BEING FITTED WITH A DIESEL ENGINE TO CREATE THE T-80U"

50 GREATEST TANKS

T-80
COMMISSIONED: 1976
WEIGHT: 43.7 TONS
RANGE: 210-230 miles
ENGINE: GTD-1000TF GAS TURBINE
CREW: 3
ARMOUR: HULL/GLACIS ROLLED STEEL PLATE WITH LAMINATE. TURRET CAST STEEL ARMOUR SHELL WITH FRONTAL CAVITY FILLED WITH CERAMIC RODES
PRIMARY WEAPON: 1 x 125mm 2A64M-1
SECONDARY WEAPON: 1 x NVST 12.7 MG

Two T-80UDs in Red Square during the failed coup to oust the Soviet president Mikhail Gorbachev, in the summer of 1991

IS-II HEAVY TANK 1944-LATE 1950S

Lighter than either the Tiger I or II, the IS-II was an effective Soviet heavy tank for the last two years of the war

First seeing service in early 1944, the IS-II had arisen out of the need for a heavy tank with a bigger calibre gun that could take on the Panther, Tiger and Koenigstiger. Its 122mm gun could defeat these three tanks but although well-armed and well-armoured the German perception was that it was both slow to manoeuvre and slow to fire. The IS-II was not envisaged as engaging in fire-fights with German panzers but to assist in creating Soviet breakthroughs of the enemy line, prising open a hole in the defences to permit the lighter T-34s to drive through. IS-II units played a major role in the Soviet summer offensive of 1944 and in the final operation against Berlin in April 1945.

Soldiers of the Red Army pose for a group photo on an IS-2 heavy battle tank in front of the Brandenburg Gate after the fall of the city in the Second World War

50 GREATEST TANKS

IS-II
COMMISSIONED: 1943
WEIGHT: 46 TONS
RANGE: 150 miles **CREW:** 4
ENGINE: V-21S 520 HP DIESEL
ARMOUR: GLACIS 90-120mm, TURRET FRONT 160mm
PRIMARY WEAPON: 1 x D-25T MODEL 1943 122mm
SECONDARY WEAPON: 1 x DSHK MODEL 1938 12.7MG, 1 x 7.62mm MG

50 GREATEST TANKS

T-10
COMMISSIONED: 1953 **WEIGHT:** 45.5 TONS **RANGE:** 217km
ENGINE: V-2-IS(V2K) **CREW:** 4
ARMOUR: TURRET 25-230mm, HULL FRONT 110-273mm
PRIMARY WEAPON: 122mm D-25 M-1943 **SECONDARY WEAPON:** 2 x 14.5mm KPV MGS, 1 X 12.7mm DSHK AAMG

T-10 1953-1970

This series was the last heavy tank to be built in the Soviet Union, culminating in the formidable T-10M

Originally designed as the IS-8, this heavy tank was renamed after Stalin's death, becoming the T-10. Moving though a series of iterations, the culmination of the line and indeed of the of Russian heavy tank, was the T-10M, that entered service in 1957. Mounting a new and more powerful main gun which could penetrate 185mm at 1,000m, the existence of this tank caused consternation among NATO Planners. Some 8,000 T-10s were built.

Right: The T-10 was the final iteration of the IS series of Soviet heavy tanks

BT-7 1935-1945

The Soviet BT-7 was a capable tank that was proven in combat and preceded the legendary T-34

The Soviet BT-7 tank exhibited classic design elements of future Red Army tanks and preceded the famed T-34

In the mid-1930s, the Soviet Red Army introduced the BT-7 cavalry tank, a relatively light and highly mobile armoured fighting vehicle built to rapidly exploit breaches in enemy lines and perform reconnaissance functions. The BT-7 was the last in a series of successful Soviet designs that were lightly armoured but typically outgunned enemy tanks with a turret-mounted 45mm cannon. Its predecessor, the BT-5 was deployed with Republican forces during the Spanish Civil War and fought the Japanese in Manchuria in the 1930s.

The BT-7 remained in service throughout World War II and was the primary Red Army cavalry tank with the outbreak of Operation Barbarossa, the Nazi invasion of the Soviet Union. The tank was one of several Soviet designs that incorporated a suspension developed by American engineer Walter Christie, and its successor was the famed T-34 medium tank. Between 1935 and 1940 at least 2,700 BT-7 variants were produced.

50 GREATEST TANKS

BT-7
COMMISSIONED: 1935
WEIGHT: 15.3 TONS
RANGE: 250km
ENGINE: 1 X MIKULIN M-17T V-12 PETROL ENGINE DEVELOPING 450 HORSEPOWER **CREW:** 3
ARMOUR: 6-40mm
PRIMARY WEAPON: 1 X 45mm L46 CANNON **SECONDARY WEAPON:** 2 X 7.62mm (.30-CAL.) DT MACHINE GUNS

Many T-54s and T-55s from the USSR and Warsaw Pact countries took part in 'Operation Danube' – the invasion of Czechoslovakia in 1968

50 GREATEST TANKS

T-54/T-55
COMMISSIONED: (T-54) 1945, (T-55) 1955
WEIGHT: <40 TONS
RANGE: 500km **CREW:** 4
ENGINE: V-55 V-12 DIESEL
ARMOUR: TURRET FRONT 203mm , GLACIS 97mm
PRIMARY WEAPON: 1 x 100mm D-10T **SECONDARY WEAPON:** 1 x 7.62mm MG

T-54/T-55
1947-PRESENT
The main Soviet tank series of the early to mid-Cold War and exported in large numbers worldwide to client states

Initially derived from the T-44 – itself a successor to the T-34 – the T-54 emerged post war to become the standard tank of the Red Army and its Warsaw Pact Allies. Its prevalence worldwide from the 1960s through to the noughties has been due to it also being manufactured in countries other than Russia, with an estimated 40,000 plus being produced.

The definitive turret – shaped like a bisected egg – entered service in the early 50s being designed the T-54 Model 1951. It had immensely thick armour for a medium tank and was armed with, for its time, a powerful DT-10 100mm gun and was a very compact design. The T-54 first saw action in the Hungarian Uprising in 1956. In Russian service, the tank underwent periodic upgrading, the evolution of which in 1955 was so comprehensive that it was designated the T-55. The T-55 was in production from 1958 through to 1965 with the T-55A from 1962-65, by which time some 8,100 had been built. This type was also extensively exported and has seen and is seeing service worldwide. But as early as 1973, it had proven vulnerable to the Israeli 105mm L7 armed Centurions and M48 tanks.

IS-III HEAVY TANK 1944-1968
Too late for World War II the IS-III saw action in other conflicts

The IS-III was first seen in public in the victory parade held in Berlin by the victorious allies in September 1945 – for the British and Americans it came as a shock. Such was its perceived superiority that it prompted emergency heavy tank programmes in those two countries, leading to the Conqueror and M-103. However, the IS-3 was less than successful in Soviet service. It saw combat with the Egyptian Army in 1967.

50 GREATEST TANKS

IS-III
COMMISSIONED: 1944
WEIGHT: 45.8 TONS
RANGE: 130 miles **CREW:** 4
ENGINE: V-2-IS (V2K)
ARMOUR: GLACIS 110-120mm, TURRET FRONT 90 mm
PRIMARY WEAPON: 120mm D-25 T
SECONDARY WEAPON: 1 x DSHK 12.7 MG, DT7.62mm MG

Images: Alamy, Getty

GREATEST TANKS

UNITED KINGDOM

WORDS MICHAEL E. HASKEW

In response to the stalemate of trench warfare in WWI, Britain brought the tank to the battlefield and revolutionised modern land combat

A pioneer in the development of the tank and its deployment to the battlefield, the British endorsed the earliest armoured fighting vehicles that were tested and entered production during the World War I era. Along with that commitment, a doctrine related to three types of tanks, as well as a specific division of labour, came to dominate the thinking of the British military establishment by the mid-20th century. Light tanks were to be developed for reconnaissance, infantry tanks with plenty of armour protection and heavy weapons were to support ground troops, and cruiser tanks, swift and mobile, were to burst through ruptures in enemy lines, wreak havoc in rear areas, and destroy enemy vehicles in tank versus tank encounters.

This perspective dominated the development of tanks in Britain into World War II, finally giving way to the concept of the main battle tank. Lessons learned from the deployment of armoured vehicles, which were often disappointing in performance, led to further innovation and more effective designs. These lessons were applied with great success in vehicles that emerged during the Cold War, prevailing into the present.

CHIEFTAIN 1963-PRESENT

The Chieftain entered service during the Cold War and was rapidly recognised as one of the world's finest main battle tanks

The bitter lessons of tank versus tank combat during World War II were not lost on the British military establishment. Tank designs that were inadequately armed and armoured gave way to a new vision during the post-war years and into the Cold War. Although the origin of the Chieftain main battle tank dates to the late 1940s, the system did not enter service with the British Army until the early 1960s. British engineers recognised that heavier weapons, stout armour protection and mobility were requirements for victory, let alone survival on the potential battlefields of Cold War Europe. With the Chieftain they succeeded handsomely in making their vision a reality.

During the early years of the Cold War, the Centurion was the mainstay of British forces arrayed against the threat of Soviet offensive action in Europe, and it was apparent that the Warsaw Pact, with its T-54/55 and T-62 tanks, was a threat to the security of NATO countries. While the Centurion served well, the necessity for the development of a tank that was at least on par with emergent Soviet designs was readily apparent. By 1958, Leyland Motors had accepted the challenge of producing a prototype that fulfilled specifications for a new main battle tank that would accomplish this formidable task.

In 1963, the British Army took possession of the first production Chieftain, and concerns were voiced that its considerable weight (53.1 tons) would be detrimental to performance in the field. However, the positive attributes of the Chieftain readily came to light and eclipsed those concerns. For example, the L11A5 120mm rifled cannon introduced the high-velocity calibre that soon became standard across NATO armed forces. When the initial powerplant was deemed inadequate, engineers made changes that addressed the shortcoming. Actual armour protection remains classified, but its homogeneous cast and welded nickel steel was obviously a major improvement over previous types. Laser rangefinding equipment was an early upgrade, increasing the accuracy of the main cannon. The interior of the Chieftain followed standard British design precepts, and in the field the tank proved worthy of international praise.

The Chieftain served as the frontline tank in British armoured units well into the 1980s.

50 GREATEST TANKS

CHIEFTAIN

COMMISSIONED: 1963 **LENGTH:** 7.52m (11ft, 6in) **RANGE:** 500km (310 mi) **ENGINE:** 1 X LEYLAND L-60 NO. 4 MARK 8 12-CYLINDER MULTIFUEL 750 HORSEPOWER **CREW:** 4 **ARMOUR:** CLASSIFIED, UP TO 203mm (8in) **PRIMARY WEAPON:** 1 x 120mm ROYAL ORDNANCE L11A5 RIFLED CANNON **SECONDARY WEAPON:** 1 x 12.7mm (.50CAL) L21 MACHINE GUN; 1 x 7.62mm (.30CAL) L37 GP MACHINE GUN

*The robust British **Chieftain main** battle tank provided outstanding service to NATO forces at the height of the Cold War*

Image: Peter Trimming

MATILDA II

COMMISSIONED: 1938
WEIGHT: 27 TONS
RANGE: 257km (160 mi)
ENGINE: 2 x AEC SIX-CYLINDER DIESEL OR 2 X LEYLAND PETROL ENGINES DEVELOPING 85 HORSEPOWER **CREW:** 4
ARMOUR: 20mm TO 78mm (3.07in)
PRIMARY WEAPON: 1 x ORDNANCE QF 2-POUNDER (40mm) GUN
SECONDARY WEAPON: 1 x 7.92mm MACHINE GUN

MATILDA II 1938-1955

For a short time the Matilda II tank reigned supreme among armoured vehicles in the Desert War

Officially known as the A12 Infantry Tank Mark II, the Matilda II was a dominant force for the British Army during combat against the Italians in the Western Desert in 1940. Heavily armoured and mounting the Ordnance QF 2-pounder gun, the Matilda II, also known as the Matilda Senior, was superior to Italian tanks and earned the nickname "Queen of the Desert". The design proved outstanding in the infantry support role as well. The Matilda II also temporarily halted a German armoured thrust at Arras during the Battle of France that year.

Although the Matilda II was relatively slow, its armament and armour protection made it lethal and virtually impervious to Italian anti-tank gunfire. However, its turret was too small to accommodate a heavier weapon. Furthermore, the introduction of German tanks with 50mm and 75mm cannon, along with the 75mm Pak 40 anti-tank gun and the deadly 88mm flak cannon in the anti-tank role, made the Matilda II vulnerable. Although its reign was brief, eclipsed by the introduction of heavier modern tank types in wartime, the Matilda II holds the distinction as the only British tank to have served throughout World War II. Nearly 3,000 Matilda IIs were produced between 1937 and 1943.

A Matilda tank during operations in the Western Desert in 1940

TURRET
The Matilda II turret was hydraulically powered, and three crewmen, including the commander, gunner and loader, were positioned in the rather cramped space.

ENGINES
A pair of six-cylinder, seven-litre water-cooled AEC engines, the same powerplants that drove London city buses, powered the Matilda II tank. An alternative to the AEC diesel engines powering the Matilda II were a pair of Leyland six-cylinder petrol engines that generated slightly more horsepower.

2-POUNDER GUN
The QF 2-pounder (0.9kg) gun was developed by the Royal Arms Arsenal at Woolwich as a turret-mounted main weapon for tanks and a towed anti-tank weapon.

CREW COMPARTMENT
The Matilda II driver sat forward and centred in the tank crew compartment. The gear selector was installed to his right and the steering lever at his left.

ARMOURED SKIRTS
Heavy armour side skirts and mud chutes protected the wheels and tracks of the Matilda II, and improved mobility in difficult terrain and weather conditions.

50 GREATEST TANKS

MARK I
COMMISSIONED: 1916
WEIGHT: 28 TONS (MALE) 27 TONS (FEMALE) **RANGE:** 38km (23.6 mi)
ENGINE: 1 x DAIMLER-KNIGHT SIX-CYLINDER, 16-LITRE PETROL
CREW: 8 **ARMOUR:** 6-12mm (.24-.47in)
PRIMARY WEAPON: 2 x HOTCHKISS QF SIX-POUNDER GUNS (MALE); 4 x .303CAL VICKERS MACHINE GUNS (FEMALE) **SECONDARY WEAPON:** 3 x .303CAL HOTCHKISS MACHINE GUNS (MALE); 1 x .303CAL HOTCHKISS MACHINE GUN (FEMALE)

MARK I 1916-1918

This tank made history at the Battle of the Somme in September 1916

The British Mark I was the first tank to enter combat, making its debut at the Battle of the Somme in September 1916. The Mark I was built in "Male" and "Female" variants: the Male mounted two six-pounder guns along with machine guns, while the Female was armed with machine guns only.

A British Mark I Male tank operates with infantrymen on the Western Front during World War I

CHALLENGER 2 1998-PRESENT

This proven combat platform wracked up an impressive record during Operation Iraqi Freedom

With the end of Operation Iraqi Freedom, the Challenger 2 could rightly claim its position as one of the finest – if not the finest – main battle tanks in the world. Only one Challenger 2 was destroyed in Iraq, and this was the result of friendly fire from another Challenger 2. Two other tanks were damaged by rocket-propelled grenades and improvised explosive devices. Reports from the field confirmed that one Challenger 2 took multiple hits from rocket-propelled grenades and an anti-tank missile, and survived with little damage. Such a combat record confirmed the expectations of the British Army and the engineers of BAE Land Systems Division in the development of the Challenger 2, the first British tank developed and produced by a single contractor since World War II.

Although the Challenger 2 shares a common name with its predecessor, the Challenger 1, only about five per cent of the earlier tank's components, most of them related to its automotive components, were retained. Emergent technology was incorporated throughout, from target acquisition and rangefinding to the main weapon, the Royal Ordnance L30A1 rifled cannon equipped for longer life in the field. Development of the Challenger 2 began in 1986, and the tank entered service in 1998 with an expected life extending until at least 2035.

50 GREATEST TANKS

CHALLENGER 2
COMMISSIONED: 1998 **WEIGHT:** 61.5 TONS
RANGE: 450km (280 mi)
ENGINE: 1 x 12-CYLINDER PERKINS CATERPILLAR CV-12 DIESEL ENGINE GENERATING 1,200 HORSEPOWER **CREW:** 4
ARMOUR: CLASSIFIED CHOBHAM DORCHESTER LEVEL 2
PRIMARY WEAPON: 1 x ROYAL ORDNANCE L30A1 RIFLED GUN
SECONDARY WEAPON: 1 X 7.62MM (.30CAL) HUGHES L94A EX-34 CHAIN GUN; 1 X 7.62MM (.30CAL) L37A2 GPMG

One of the world's finest main battle tanks, a Challenger 2 of the Queen's Royal Lancers rests in Basra, Iraq

Photo: Graeme Main/MOD

WHIPPET 1918-1930

This medium tank was intended to work in cooperation with heavier tanks to exploit a breakthrough of enemy lines

A Whippet tank pauses as infantrymen march past during efforts to stem the German offensive of March 1918 on the Western Front

Conforming to early British armoured doctrine, the Medium Mark A Whippet tank was designed to emphasise firepower and mobility, taking advantage of breaches in enemy lines to dash through and wreak havoc in rear areas. The Whippet was deployed in combat for the first time in March 1918 and proved highly successful. Armed only with machine guns, it was not intended to fight enemy tanks. Instead, it was effective against enemy troop concentrations, and in one engagement a company of seven Whippets annihilated two German infantry battalions caught in open country, inflicting about 400 casualties. Approximately 200 Whippet tanks were built in a production run that ended in the spring of 1919, and its performance profoundly influenced the future of tank development.

50 GREATEST TANKS

WHIPPET

COMMISSIONED: 1918 **WEIGHT:** 14 TONS **RANGE:** 64km (40 mi) **ENGINE:** 2 x TYLOR TWIN JB4 FOUR-CYLINDER PETROL ENGINES GENERATING 90 HORSEPOWER **CREW:** 3 **ARMOUR:** 14mm (.55in) **PRIMARY WEAPON:** 4x .303CAL HOTCHKISS MACHINE GUNS

50 GREATEST TANKS

MARK V

COMMISSIONED: 1918 **WEIGHT:** 29 TONS **RANGE:** 72km (45 mi) **ENGINE:** 1 X RICARDO SIX-CYLINDER PETROL ENGINE GENERATING 150 HORSEPOWER **CREW:** 8 **ARMOUR:** 6mm - 14mm (.24 - .55in) **PRIMARY WEAPON:** 2 x SIX POUNDER (57MM) QF GUNS (MALE); SIX .303CAL HOTCHKISS MK 1 MACHINE GUNS (FEMALE) **SECONDARY WEAPON:** 4 x HOTCHKISS 7.7mm (.30in) MK1 MACHINE GUNS (MALE)

MARK V 1918-1941

A significant improvement over predecessors, this was the zenith of early tank design

Entering service in 1918 during the last months of World War I, the Mark V tank was originally intended as a totally new armoured fighting vehicle for the British Army. Instead, it built on the lessons learned with earlier variants. By the end of the Great War at least nine iterations of the original Mark I had been developed, and the Mark V was a significant advance technologically even over its recent predecessor, the Mark IV.

Although concerns related to its reliability in the field and ventilation systems remained, the Mark V included improvements in steering and powerplant. The tank was produced in both "Male" and "Female" versions, the Male armed with six-pounder guns and machine guns, while the Female carried only machine guns.

"BY THE END OF THE GREAT WAR AT LEAST NINE ITERATIONS OF THE ORIGINAL MARK I HAD BEEN DEVELOPED"

The Mark V was a significant advance over the Mark IV

Image: Alan Wilson

Images: Alamy, Alex Pang

GREATEST TANKS

GERMANY

WORDS MARK HEALY

However we define 'greatest', there is no question that Germany, particularly under the Third Reich, is responsible some of the most influential and effective tank designs ever produced

The first generation of German armour – Panzers I to IV – were not of themselves superior to their opponents, their effectiveness in the first three years of the Second World War being primarily explicable in terms of how they were employed. It was the Russian Campaign that forced the Germans to embrace a new design to counter the initially superior Soviet T-34 and KV series. This led to the creation of the Panther heavy medium tank and the fielding of the Tiger I and II heavy panzers in the last two years of the conflict. Even though by then the war was lost, German tanks continued to exert heavy losses on its enemies both east and west.

After 1945, a medium panzer for the new Bundeswehr led to the creation of one of the most successful families of tanks of the post-war period. The Leopard 1 and its successor, the Leopard 2, went on to equip many armies of NATO and other nations. Modern German armour is held in high regard the world over and is a byword for technological sophistication and excellence.

PANTHER (PANZERKAMPFWAGEN V)

1943-1945 Was this the best medium tank of the Second World War?

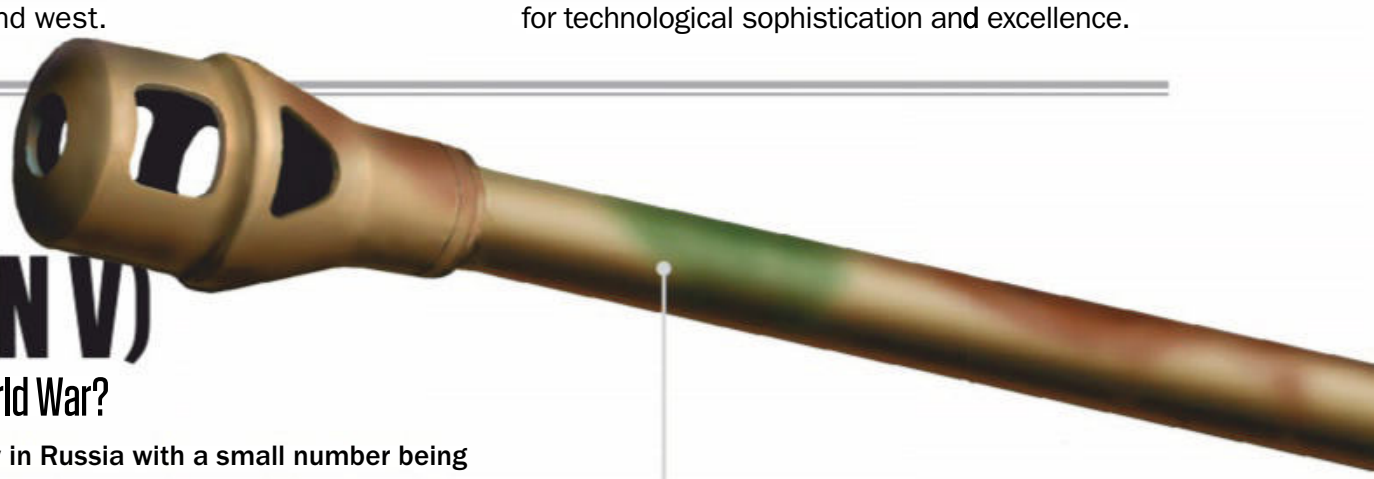
Regarded by many as the finest medium tank of the Second World War, the Panther was commissioned in the first instance to counter the Russian T-34 whose sloping armour design it was to emulate. It was produced in three main variants, denoted by the letters D, A and G, with just under 6,000 produced by the time production ended in April 1945.

Despite the problems experienced by the tank during its production life – a consequence of the rapidity with which the Panther was developed and the urgency to get it onto the battlefield – it nonetheless has been deemed to have provided the best balance of protection, firepower and mobility of any in the conflict.

Although its debut during the battle of Kursk in July 1943 revealed teething problems, its 75mm L/70 main gun proved devastating, accounting for more Russian tanks than any German panzer with T-34s being knocked out at ranges from 1,500 to 2,000-metres. However, the thinner side armour of the Panther made it vulnerable to flanking attacks. Until early 1944 the Panther served solely in Russia with a small number being despatched thereafter to Italy. It was however in northwest Europe that the Allies encountered it in large numbers following D-Day in June 1944. Over 600 Panthers were committed by the Germans to contain the allied bridgehead. Battling in the dense foliage of the bocage the Allies discovered to their dismay that the Panther's heavy frontal armour was exceedingly difficult to penetrate except at very close range, with only the 17pdr armed Sherman being able to do so at longer range.

The Panther however could penetrate the M4 and Cromwell's frontal armour at 1,500 yards. It was for these reasons it was the panzer most feared by allied tank crews in the Normandy Campaign, even more so that the infamous Tiger.

While few Panthers survived the Normandy campaign, they continued to be encountered on both Eastern, South Western and Western Fronts with some 450 being committed to the Ardennes offensive in December 1944. It remained a potent and dangerous foe until the very end of the conflict.



A POTENT MAIN GUN

The heart of the Panther was its main gun. Its 75mm KwK42 L/70 was an exceedingly accurate long range weapon that was effective in destroying almost all types of enemy tanks.

HEAVY FRONTAL ARMOUR

It was at Hitler's insistence that the Panther be equipped with 80mm of armour on its glacis. While this raised its weight, it nonetheless conferred a remarkable degree of survivability in the face of Russian and Allied tank and anti-tank guns.

Only a small number of Panthers served in Italy during the course of 1944/45 with this example belonging to the 1 Abtl/Panzer Regiment 4. The number employed in this theatre never exceeded 76 examples

PANZERKAMPFWAGEN I 1936-1941

The tank on which the nascent Panzertruppe cut its tactical teeth

***Below:** Although already obsolete, no fewer than 1,077 Panzer Is were used in the Invasion of France in 1940*

The Panzer I was a very basic design that was primarily intended as a training machine but ended up going to war due to the lack of numbers of more effective machines. It nonetheless contributed to the mass of armour used in the early campaigns of 1939-1941. It was phased out in that year.

50 GREATEST TANKS

PANZER I

COMMISSIONED: 1933
WEIGHT: 3.5 TONS
LENGTH: 4.02 METRES
RANGE: 145km
ENGINE: KRUPP M305
CREW: 2
ARMOUR: NO THICKER THAN 13mm
PRIMARY WEAPON: 2 X MG13

HIGHLY EFFECTIVE SUSPENSION

The Panther was equipped with an overlapping, interleaved multi road wheel suspension that conferred great stability and a smooth ride for the crew, particularly cross country. This made the Panther an excellent gun platform.

50 GREATEST TANKS

PANTHER

COMMISSIONED: 1942
LENGTH: 8.86m **WEIGHT:** 45.5 TONS **RANGE:** 200km
ENGINE: MAYBACH HL230P30
CREW: 5 **ARMOUR:** 45mm-110mm **PRIMARY WEAPON:** 1 x 75mm KWK42 L/70
SECONDARY WEAPON: 2 x 7.92mm MG 34

PANZER IV 1938-1945

The workhorse of the German Army – this was the only panzer to serve from the beginning to the end of WWII

The Panzer IV proved to be a remarkably adaptable design. Its designated role as a support tank to the Panzer III, was changed in 1942 in order to replace the former in the medium tank role when it was determined that the Mark III could not be up-gunned to cope with the Russian T-34 and KV series.

The Mark IV had, however, been designed from the outset with a larger turret ring and thus could be fitted with a bigger gun, with the Ausf G being the first variant to mount the 75mm L/48 weapon that could defeat Russian tanks at battle ranges. Equipped with this weapon, and fitted with improved armour, the Mark IV remained in production to the war's end. Notwithstanding its primary role as the workhorse of the Panzerwaffe from 1942 onward, the chassis of the Mark IV was employed for a whole host of tank destroyers, assault guns and panzer artillery. Nor did its service life end in 1945. It soldiered on with the Spanish Army into the 1950s and was supplied to the Syrian Army by the Soviet Union, where a number were encountered and destroyed by the Israeli Army in the Six Day War.

"THE CHASSIS OF THE MARK IV WAS EMPLOYED FOR A WHOLE HOST OF TANK DESTROYERS, ASSAULT GUNS AND PANZER ARTILLERY"

TIGER I (PANZERKAMPFWAGEN VI) 1942-1945

The most famous tank ever built had plenty of flaws but was packed with ambitious and dominant design features

The largest numbers of Tiger Is committed to any action was at the Battle of Kursk in July 1943

50 GREATEST TANKS

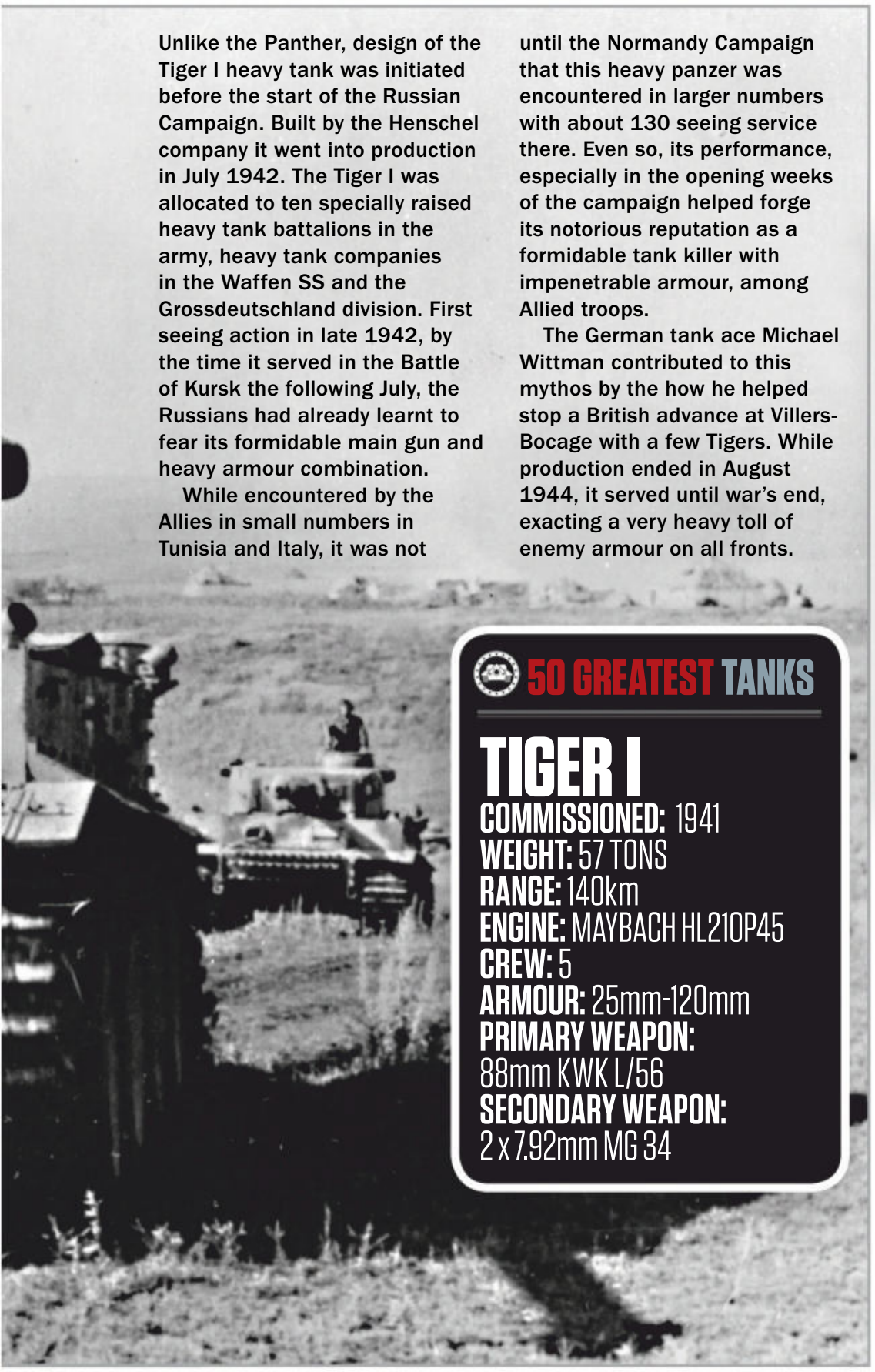
PANZER IV

COMMISSIONED: 1930
WEIGHT: 25 TONS
RANGE: 210km **CREW:** 5
ENGINE: MAYBACH HL 120TRM
ARMOUR: 30mm-80mm
PRIMARY WEAPON: 75 mm KWK 37 L/24 (AUSF A THROUGH AUSF F1), 75mm KWK40 L/48 (AUSF G THROUGH AUSF J)
SECONDARY WEAPON: 2 x 7.92mm MG 34

Unlike the Panther, design of the Tiger I heavy tank was initiated before the start of the Russian Campaign. Built by the Henschel company it went into production in July 1942. The Tiger I was allocated to ten specially raised heavy tank battalions in the army, heavy tank companies in the Waffen SS and the Grossdeutschland division. First seeing action in late 1942, by the time it served in the Battle of Kursk the following July, the Russians had already learnt to fear its formidable main gun and heavy armour combination.

While encountered by the Allies in small numbers in Tunisia and Italy, it was not until the Normandy Campaign that this heavy panzer was encountered in larger numbers with about 130 seeing service there. Even so, its performance, especially in the opening weeks of the campaign helped forge its notorious reputation as a formidable tank killer with impenetrable armour, among Allied troops.

The German tank ace Michael Wittman contributed to this mythos by the how he helped stop a British advance at Villers-Bocage with a few Tigers. While production ended in August 1944, it served until war's end, exacting a very heavy toll of enemy armour on all fronts.



50 GREATEST TANKS

TIGER I
COMMISSIONED: 1941
WEIGHT: 57 TONS
RANGE: 140km
ENGINE: MAYBACH HL210P45
CREW: 5
ARMOUR: 25mm-120mm
PRIMARY WEAPON: 88mm KWK L/56
SECONDARY WEAPON: 2 x 7.92mm MG 34

PANZER III 1939-1943

This was the most important and successful tank of the Panzerwaffe until the summer of 1941, when its limitations were made apparent by T-34s

50 GREATEST TANKS

PANZER III
COMMISSIONED: 1935
WEIGHT: 21.5 TONS
RANGE: 155km
ENGINE: MAYBACH HL120TRM
CREW: 5
ARMOUR: 15mm-50mm
PRIMARY WEAPON: (AUSF J) 50mm KWK L/42 (1,549 BUILT), 50mm KWK L/60 (1,067 BUILT)
SECONDARY WEAPON: 2 x 7.92mm MG 34

The Panzer III was always envisaged as being the primary medium tank of the Panzertruppe from the time of its inception through to the encounter with the Soviet T-34 in the summer of 1941, when it was shown to be wanting. Its replacement led to the development of the Panther. Nonetheless, the Mark III in the form of the Ausf M remained in production until February 1943, still being the most numerous German tank at the Battle of Kursk in July. The Mark III was the principal panzer employed in the campaigns between 1939-1942 and a major factor in Germany's early victories. It was a respected adversary of the British in the Western Desert. Its chassis was employed for the highly successful Assault Gun.

The Panzer III was fielded in two variants – the earlier with the 50mm L/42 main gun and the later, with the 50mm L/60 weapon.

STURMPANZERWAGEN A7V 1918

This first foray for German armour was a lumbering behemoth, developed in response to the debut of British tanks on the battlefield

After British tanks appeared in battle at the Somme in 1916, the German response was essentially a steel box on a tractor chassis. The Sturmpanzerwagen A7V is remarkable not because of its battlefield performance, which fell well short of expectations, but because it was the forerunner of innovative German designs that were undertaken before the end of World War I and manifested themselves fully a generation later.

The prototype A7V was completed in September 1917, and the massive machine entered combat on 21 March 1918, becoming involved in the first documented tank versus tank combat in history. The ungainly A7V, however, proved unable to negotiate the rugged terrain of the Western Front. Its cramped compartment held a crew of 18 men, who were often overcome with the noxious fumes from its engines. Its heavy armour and high profile made the vehicle unstable. Unlike later German tanks, early engineers sacrificed speed for armour protection. Only 20 became operational.

The A7V was a disappointment in combat but became the forerunner of later successful tank designs

50 GREATEST TANKS

A7V
COMMISSIONED: 1918 **CREW:** 18 **WEIGHT:** 35.8 TONS **RANGE:** 80km **ENGINE:** 2 X DAIMLER-BENZ 4-CYLINDER INLINE 165204 PETROL ENGINES DEVELOPING 100 HORSEPOWER EACH **ARMOUR:** 20-30MM **PRIMARY WEAPON:** 1 X 57MM L/12 MAXIM-NORDENFELT SHORT RECOIL GUN **SECONDARY WEAPON:** 6 X 7.92MM (.31-CAL.) MG08 MACHINE GUNS

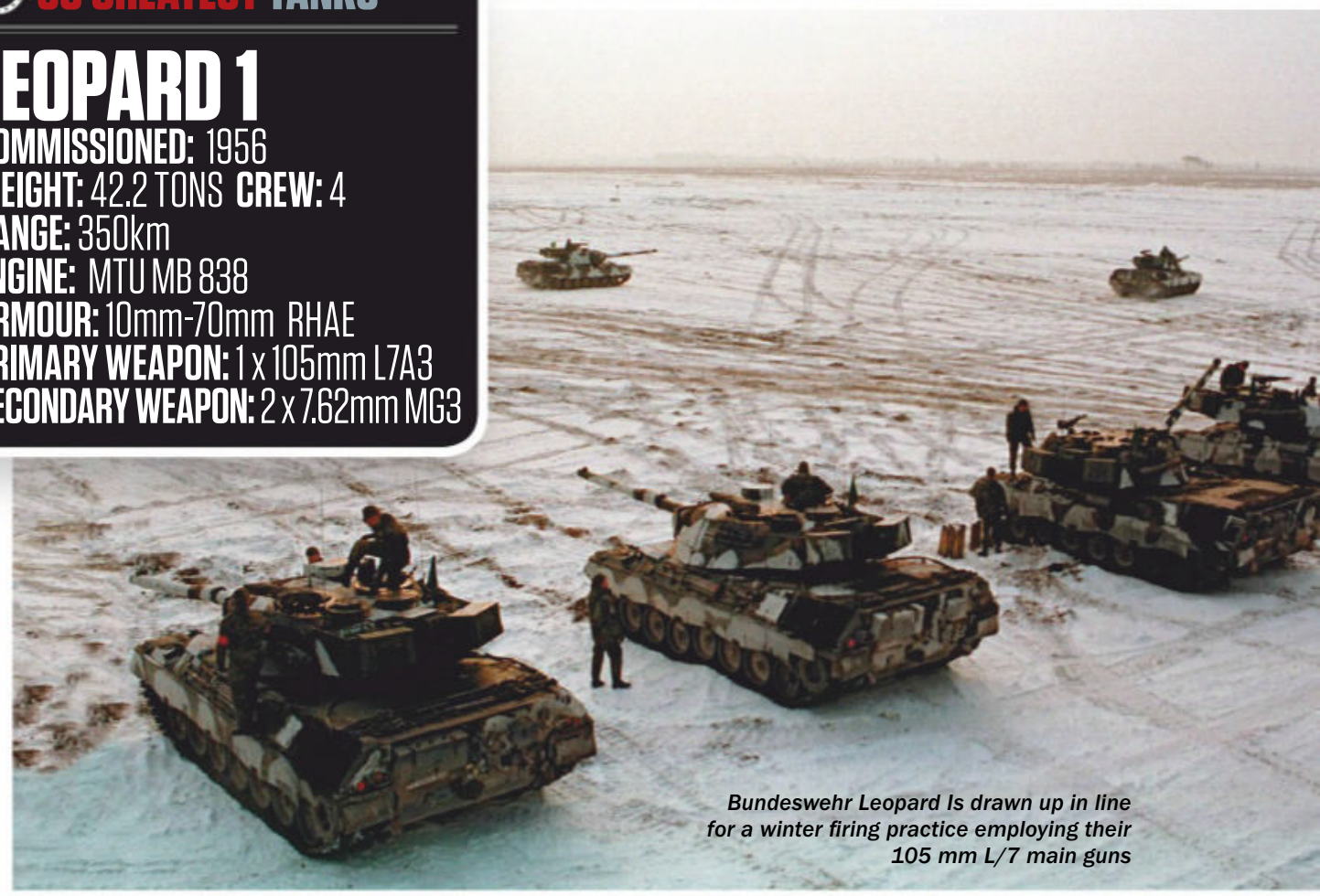
LEOPARD 1 1965-PRESENT

Sacrificing speed and power for heavy armour the Leopard I saw action in many countries

When in 1956 the new German Federal Armed Forces issued a specification for a main battle tank it was to weigh just 30 tons – although this was to increase over the production life of the type. What emerged was the Leopard I, wherein speed and agility were substituted for heavy armour. It was armed with the British originated 105mm L7 gun. Between 1965 when production began and continued through to 1984, 4,744 were built of which 2,237 served with the armoured units of the Bundeswehr and the rest going for export. Repeatedly upgraded it remained in German service until 2003 and is still employed abroad. It was the primary tank of the Bundeswehr throughout the Cold War and remains a highly regarded tank.

50 GREATEST TANKS

LEOPARD 1
COMMISSIONED: 1956
WEIGHT: 42.2 TONS **CREW:** 4
RANGE: 350km
ENGINE: MTU MB 838
ARMOUR: 10mm-70mm RHAE
PRIMARY WEAPON: 1 x 105mm L7A3
SECONDARY WEAPON: 2 x 7.62mm MG3



Bundeswehr Leopard Is drawn up in line for a winter firing practice employing their 105 mm L/7 main guns

“REPEATEDLY UPGRADED IT REMAINED IN GERMAN SERVICE UNTIL 2003 AND IS STILL EMPLOYED ABROAD”

KING TIGER (PANZERKAMPFWAGEN VI AUSF B ‘KOENIGSTIGER’) JUNE 1944-1945

The heaviest and most powerfully armed tank of the Second World War

50 GREATEST TANKS

KING TIGER
COMMISSIONED: 1943
WEIGHT: 68 TONS **RANGE:** 170km
ENGINE: MAYBACH HL230P30
CREW: 5
ARMOUR: 25mm-185mm
PRIMARY WEAPON: 88MM KWK43 L/71
SECONDARY WEAPON: 2 x 7.92mm MG 34

Developed to mount the exceptionally powerful 88mm Pak 43 L/71 weapon, the Tiger II adopted the basic design of the Panther, albeit enlarged. The first 50 of the design employed a turret manufactured by Porsche with this being replaced until production ended in March 1945 by one manufactured by Henschel. While the manufacture of this type absorbed great resources with the small number of 489 built precluding the Tiger II making any significant contribution to Germany’s war effort. But that being said its main gun could defeat any Russian or Allied tank. It was however plagued by mechanical weakness and was symptomatic as Heinz Guderian observed in Normandy, where a small number were employed, of the trend of “our tanks becoming too heavy”.

50 GREATEST TANKS

LEOPARD 2
COMMISSIONED: 1977
WEIGHT: 62 TONS
RANGE: 500km
ENGINE: MTU MB 873 KA-501
CREW: 4 **ARMOUR:** A6: 3RD GENERATION COMPOSITE
PRIMARY WEAPON: 1 x Rheinmetall 120 L/44 in 2A4 (L/55 in 2 A6/A7)
SECONDARY WEAPON: 2 x 7.62mm MG 3 A1

Leopard 2A6s on exercise in 2016. This was the first variant of the Leopard II to mount the L/55 main gun

PANZERKAMPFWAGEN II 1936-1944

The Panzer II was the most numerous tank in the Panzer divisions at the beginning of the war

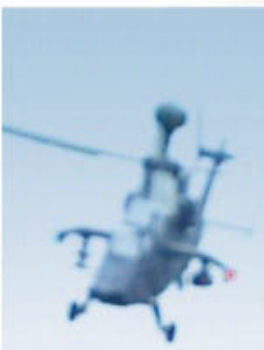
50 GREATEST TANKS

PANZER II

COMMISSIONED: 1934
WEIGHT: 7.6 TONS
RANGE: 200km
ENGINE: MAYBACH HL57TR
CREW: 3
ARMOUR: 5mm-15mm
PRIMARY WEAPON:
1 x 20mm KwK L/55
SECONDARY WEAPON:
2 x 7.92mm MG 34

Along with the Panzer I and Pz 38(t) the Panzer II helped provide the mass of German armour in the opening years of World War II. The Pz II was extensively modified over its production life which ended in December 1942. However, a development designated the Ausf L 'Luchs' was built between September 1943 to January 1944.

A Panzer II abandoned after the German defeat at the Battle of El Alamein in October 1942



LEOPARD 2 1979-PRESENT

One of the most powerful and effective contemporary tanks with world-wide sales

Following a series of abortive attempts to develop a new tank first in the US and then the UK, West Germany decided to produce its own replacement for the Leopard I. From this emerged the Leopard 2 which went into production in 1979 and continued until 1992 after 2,125 had been built. The Leopard has been repeatedly upgraded especially in its armour configuration with the latest variant being the 2A7. It is armed with an indigenous 120mm smooth bore gun. The Leopard 2 has repeated the export success of the Leopard I, having been used by the Dutch, the Swiss, Swedish, Spanish, Finnish, Austrian, Danish and Turkish armies. It was with the latter that it saw its first combat in northern Syria.

"THE LEOPARD HAS BEEN REPEATEDLY UPGRADED ESPECIALLY IN ITS ARMOUR CONFIGURATION WITH THE LATEST VARIANT BEING THE 2A7"

Images: Alamy, Getty, Alex Pang

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GREATEST TANKS

REST OF THE WORLD

WORDS **MICHAEL E. HASKEW**

The face of combat evolved substantially during the 20th century, and around the globe the development of the tank in its various forms was one of the most significant aspects of this phenomenon

The evolution of tank design proceeded rapidly during the 20th century and beyond as numerous nations acquired systems or embarked on development efforts of their own. Although Great Britain, Germany, the Soviet Union, and the United States were the most prolific in driving forward the most successful tank designs, French engineers made a significant early contribution with the World War I era Renault FT-17. Later, while their country was under Nazi occupation during World War II, engineers continued working on tank designs of the future.

During the post-war era, many countries, including China, Israel, India, Sweden, and others, have determined that their national security and the relative capabilities of their armed forces are centred on developing and fielding robust, modern armoured forces.

Their developmental approach has varied, buying proven systems outright, licensing technology from other countries to incorporate into their own designs, and fostering emerging domestic programs.

Among the notable products of these initiatives are the Israeli Merkava, Indian Arjun, and South Korean K2 Black Panther. As more countries opt for their own designs, continuing innovation is sure to follow, but here are some of the most successful contributions to tank development from around the world.

In the middle of World War I, the French Renault FT-17 light tank revolutionised armoured vehicle design

TRACK CONFIGURATION

A large forward idler wheel was fitted to each track to improve the FT-17's ability to negotiate battlefield hazards such as shell holes and to climb over obstacles that would otherwise impede its progress.

HULL CONSTRUCTION

The FT-17 was constructed without an actual chassis. Components were attached or riveted directly to the tank's hull, which was constructed with steel plating. Specifications called for the entire tank to weigh less than seven tons.

50 GREATEST TANKS

RENAULT FT-17

COMMISSIONED: 1917
ORIGIN: FRANCE
WEIGHT: 6.4 TONS
LENGTH: 5m (16ft, 5in)
RANGE: 60km (37 mi)
ENGINE: 35 HORSEPOWER, FOUR-CYLINDER RENAULT PETROL
CREW: 2
ARMOUR: 8mm-22mm (.31in-.87in)
PRIMARY WEAPON: 37MM PUTEAUX SA 1918 GUN
SECONDARY WEAPON: 1X OR 2X 8mm HOTCHKISS MACHINE GUNS

ROTATING TURRET

The 360-degree rotating turret mounted atop the hull of the French Renault FT-17 light tank redefined the battlefield capabilities of the weapons system, allowing the armoured vehicle to fire in any direction.

TYPE 10 2012-PRESENT

The Type 10 is the latest generation of main battle tank developed in Japan for the nation's land defence forces

The Japanese Defence Ministry acknowledged the existence of the Type 10 main battle tank in 2009, and the weapon system joined the Ground Self-Defence Force three years later. Japan Steel Works developed a new 120mm smoothbore cannon for the Type 10, which also improves anti-tank warfare capabilities over previous models.

The Type 10 main battle tank replaces earlier generations of armoured fighting vehicles with the Japan Ground Self-Defense Force

50 GREATEST TANKS

TYPE 10

COMMISSIONED: 2012
ORIGIN: JAPAN
WEIGHT: 44 TONS
RANGE: 480km (298 mi)
ENGINE: 1,200 HORSEPOWER MITSUBISHI EIGHT-CYLINDER DIESEL
CREW: 3
ARMOUR: CLASSIFIED; MODULAR CERAMIC COMPOSITE
PRIMARY WEAPON: JAPAN STEEL WORKS 120MM SMOOTHBORE AUTOLOADING GUN
SECONDARY WEAPON: 1X TYPE 74 7.62MM AND 1X BROWNING M2HB .50-CAL. MACHINE GUN

RENAULT FT-17 1917-1949

The French-built Renault FT-17 introduced design concepts that remain universal in the construction of tanks to this day

The outbreak of World War I energised the development of tanks in France, and two heavy machines, the Saint-Chamond and Schneider CA 1, were introduced. The French military establishment were following Britain's lead with ponderous tanks mounting multiple large-calibre weapons and machine guns operated by a number of crewmen. General Jean Baptiste Eugene Estienne, remembered today as the "father of the tank" in the French Army, also envisioned the tank as a mobile "strike" weapon.

Estienne approached automaker Louis Renault, requesting the development of a light tank prototype. At first Renault declined, however, Estienne persisted. By the summer of 1916 the automaker was developing a tank that would revolutionise armoured fighting vehicle design for generations. Renault may actually have been working on a light tank prior to Estienne's entreaties, and the prototype FT-17 entered production rapidly.

The FT-17 introduced innovative design elements that continue to influence modern tank development. The tank incorporated a turret capable of 360-degree traverse, allowing the vehicle to reorient its main weapon and fire in any direction. Firepower was also concentrated toward the vehicle's front with supporting machine guns placed forward.

To increase crew space, the engine was located at the rear of the FT-17, reducing the potential of a devastating fire in the crew compartment and adding weight to the rear, providing greater traction. Armed with a 37mm Puteaux SA 18 main gun and either a single or pair of Hotchkiss 8mm machine guns, the FT-17 was operated by a two-man crew. Its four-cylinder Renault petrol engine generated a top speed of 7.7km/hour (5.5mph). The first FT-17s reached the French Army in late 1917, and the tank made its combat debut at Chaudun on 31 May 1918, during the Second Battle of the Marne, blunting a German attack.

The performance of the FT-17 was obviously superior to other tank designs. Although it was continually plagued by radiator issues, nearly 2,700 were completed by the end of World War I. Its service life extended for three decades. The United States purchased a quantity of FT-17s and produced nearly 1,000 under licence.

ENGINE PLACEMENT

The four-cylinder Renault petrol engine of the FT-17 light tank was placed at the rear of the vehicle to reduce the potential of a catastrophic fire in the crew compartment and focus weight to the rear for greater traction.

50 GREATEST TANKS

AL KHALID

COMMISSIONED: 2001
ORIGIN: PAKISTAN
WEIGHT: 46 TONS
RANGE: 400km (250 mi)
ENGINE: 1,200 HORSEPOWER KMDB 6TD-2 SIX-CYLINDER DIESEL
CREW: 3
ARMOUR: CLASSIFIED; MODULAR COMPOSITE, EXPLOSIVE REACTIVE
PRIMARY WEAPON: 125MM HMC PSML SMOOTHBORE GUN
SECONDARY WEAPON: 1X 7.62MM AND 1X 12.7MM MACHINE GUNS

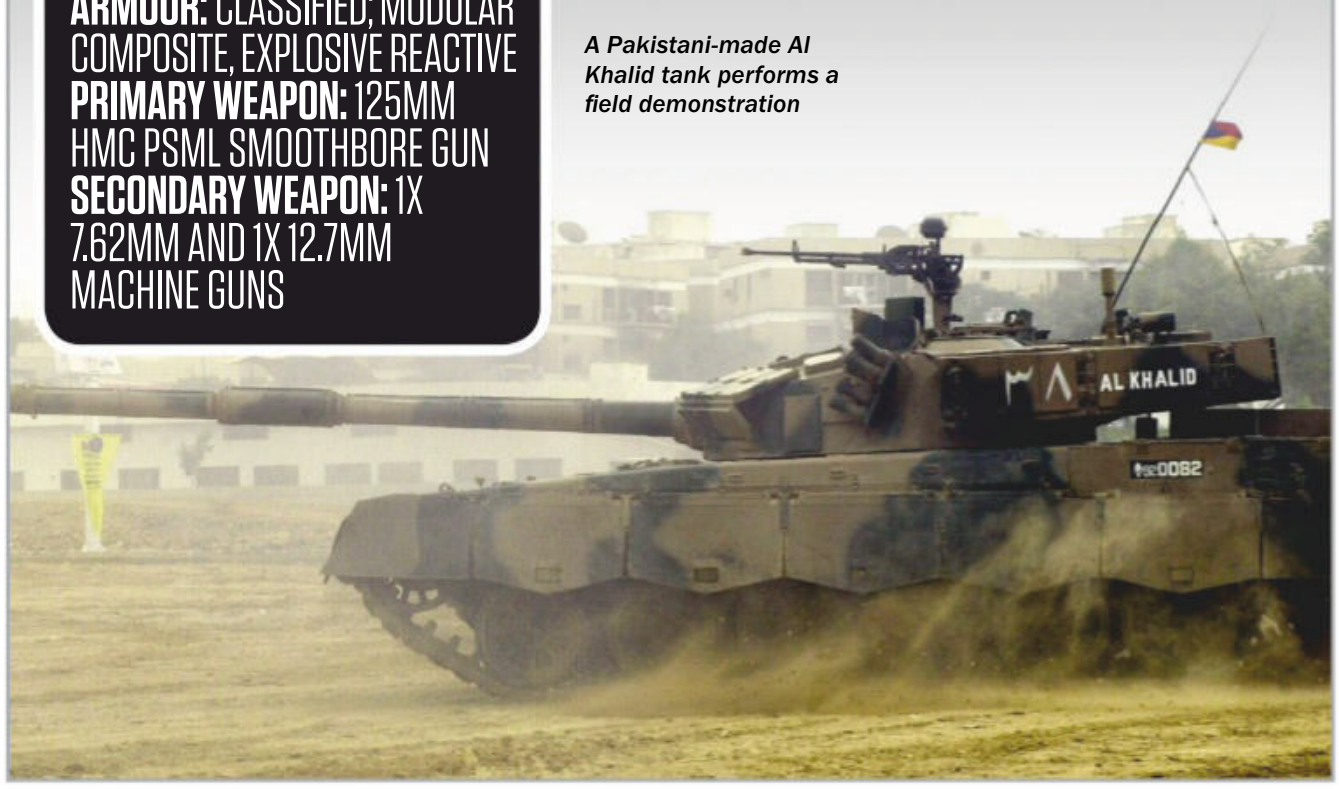
AL KHALID

2001-PRESENT

The Al Khalid main battle tank is a licence-built joint venture among three countries supplying expertise and components

Since 2001, the Chinese Type 90-II main battle tank has been built under licence in Pakistan as the Al Khalid (Sword). While substantially levering the Chinese design and components, several prototypes underwent field trials to accommodate various engines and transmissions. The Al Khalid also includes modifications from Pakistan and Ukraine.

A Pakistani-made Al Khalid tank performs a field demonstration



50 GREATEST TANKS

C1 ARIETE

COMMISSIONED: 1995
ORIGIN: ITALY
WEIGHT: 53 TONS
RANGE: 600km (375 mi)
ENGINE: 1,250 HORSEPOWER IVECO-FIAT MTCA V-12 TURBOCHARGED DIESEL
CREW: 4
ARMOUR: CLASSIFIED; LAMINATED STEEL AND COMPOSITE
PRIMARY WEAPON: 120MM OTO MELARA SMOOTHBORE GUN
SECONDARY WEAPON: 2X 7.62MM MG 42/59 MACHINE GUNS

The Italian C1 Ariete main battle tank entered service in the mid 1990s to replace the army's outmoded M60 tanks

50 GREATEST TANKS

AMX-13

COMMISSIONED: 1952
ORIGIN: FRANCE
WEIGHT: 14.76 TONS
RANGE: 400km (250 mi)
ENGINE: 250 HORSEPOWER EIGHT-CYLINDER SOFAM GASOLINE
CREW: 3
ARMOUR: 10mm-40mm
PRIMARY WEAPON: 75MM SA 50 GUN
SECONDARY WEAPON: 2X 7.5MM OR 7.62MM FN1/AAT52 MACHINE GUNS

AMX-13 1952-1987

The post-World War II French AMX-13 light tank introduced innovative concepts in design and deployment

The French arms industry recovered rapidly after World War II, and one of its first entries into the global arms market was the AMX-13 light tank, a design undertaken in 1946 by Atelier de Construction d'Issay-les-Moulineaux (AMX).

The AMX-13 was designed as airmobile for insertion with airborne troops, and it featured the FL-10 oscillating turret with an upper section that pivoted to elevate and lower the main 75mm gun. As heavier 90mm and 105mm weapons were introduced, the FL-12 turret was developed to accommodate additional weight. More than 3,000 examples of the AMX-13 were built, and the tank was widely exported. The Israel Defence Forces deployed the AMX-13 during the Suez Crisis and the Six-Day War, but subsequently withdrew it from service.

The French AMX-13 light tank was a success on the arms export market featuring an innovative oscillating turret

"THE C1 ARIETE MAIN BATTLE TANK REPLACED THE COUNTRY'S AGEING FLEET OF AMERICAN-BUILT M60 TANKS"

C1 ARIETE 1995-PRESENT

The C1 Ariete resembles other western main battle tanks but also incorporates numerous systems that are manufactured in Italy

The product of a cooperative effort between Italian companies Iveco-Fiat and Oto Melara, the C1 Ariete main battle tank replaced the country's ageing fleet of American-built M60 tanks. It mounts the state-of-the-art Galileo computerised fire control system and an Oto Melara 120mm main weapon based on the German Rheinmetall smoothbore design.

Image: 7th Army Training Command

ARJUN 2004-PRESENT

Long in development, the Arjun is the first main battle tank produced in India, although foreign assistance has played a prominent role

In 1974 India's Defence Development and Research Organisation began the long process of fielding the Arjun, the country's first indigenous main battle tank. Incredibly, 30 years later the Arjun entered service with the Indian Army. Delays dragged the project out for years, but the eventual product, heavily influenced by German engineers and consultants from Krauss Maffei, designers of the Leopard 2, actually resembles the German main battle tank. Between 25 and 30 per cent of the Arjun's components are imported, including the engine, transmission, fire control system, and gun barrel. However, the remainder of the main 120mm rifled gun was developed in country. The upgraded Arjun MK II has surpassed the Russian T-90 main battle tank's performance in trials.

50 GREATEST TANKS

ARJUN
COMMISSIONED: 2004
ORIGIN: INDIA
WEIGHT: 67 TONS
RANGE: 400km (250 mi)
ENGINE: 1,400 HORSEPOWER MTU MB 838 KA DIESEL
CREW: 4
ARMOUR: CLASSIFIED; KANCHAN MODIFIED COMPOSITE
PRIMARY WEAPON: 120MM RIFLED GUN
SECONDARY WEAPON: 1X 7.62MM MACHINE GUN; 1X 12.7MM MACHINE GUN

The development period for India's Arjun main battle tank stretched from the 1970s into the 21st century

Image: Ajai Shukla

K2 BLACK PANTHER 2014-PRESENT

South Korea's K2 Black Panther main battle tank is slated to eventually replace American-built tanks of the Patton series

The South Korean Army has placed orders for 320 of the country's latest main battle tank, the K2 Black Panther, to augment existing K1 tanks in service. Designed by the Agency for Defense Development, the K2 is manufactured by Hyundai Rotem. Production began in 2013, and 100 tanks were delivered the following year.

The South Korean K2 Black Panther main battle tank experienced production delays due to domestically produced powerplant issues

50 GREATEST TANKS

K2 BLACK PANTHER

COMMISSIONED: 2014
ORIGIN: SOUTH KOREA
WEIGHT: 54 TONS
RANGE: 450km (280 mi)
ENGINE: 1,500 HORSEPOWER DOOSAN INFRACORE CORPORATION 12-CYLINDER DIESEL
CREW: 3
ARMOUR: CLASSIFIED; COMPOSITE WITH ERA AND NERA MODULAR ADD-ON
PRIMARY WEAPON: HYUNDAI WIA 120MM SMOOTHBORE GUN
SECONDARY WEAPON: 1X 7.62MM AND 1X 12.7MM K6 MACHINE GUN

Image: Republic of Korea Armed Forces

STRIDSVAGN 103 S-TANK 1967-1997

The Stridsvagn 103 served for a quarter of a century with the Swedish military

During the mid-1960s Sweden introduced a radical departure from the prevailing main battle tank concept with the turretless Stridsvagn 103, or S-Tank (Strv 103). The Strv 103 resembled World War II era tank destroyers, exhibiting a low profile or silhouette that was ostensibly an advantage during combat in the hull-down position in undulating or heavily wooded terrain. Designer Sven Berge of the Swedish Arms Administration proposed a turretless tank that offered advantages but required the entire vehicle to be turned and elevated at times in order to acquire and fire on targets. Therefore, it was impossible for the Strv 103 to fire on the move. To compensate for this, an automated transmission, external crossbar steering mechanism, and hydropneumatic suspension were introduced, which elevated the vehicle's pitch.

Left: The turretless Swedish Stridsvagn 103 tank, resembling earlier tank destroyers, required the entire vehicle to be reoriented to fire on targets

50 GREATEST TANKS

STRIDSVAGN 103 S-TANK

COMMISSIONED: 1967 **ORIGIN:** SWEDEN
WEIGHT: 39.1 TONS **RANGE:** 390km (240 mi)
ENGINE: 290 HORSEPOWER DETROIT DIESEL 6V53T PAIRED WITH 490 HORSEPOWER CATERPILLAR 553 GAS TURBINE
CREW: 3 **ARMOUR:** 40mm -70mm
PRIMARY WEAPON: BOFORS 105MM L74 RIFLED CANNON
SECONDARY WEAPON: 2X 7.62MM KSP 58 MACHINE GUNS

Image: Jorchr

50 GREATEST TANKS

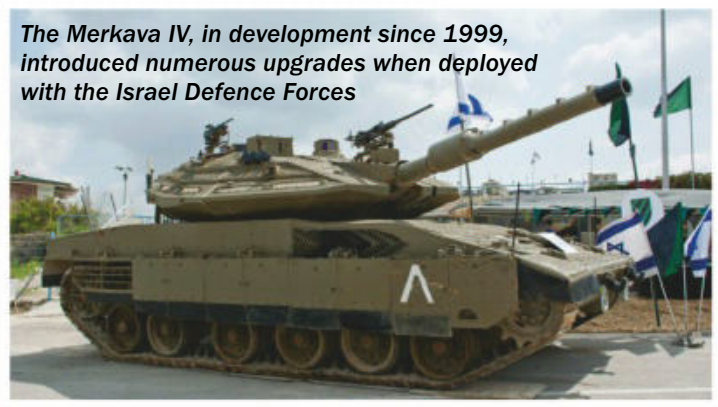
MERKAVA
COMMISSIONED: 1979
ORIGIN: ISRAEL
WEIGHT: 64 TONS
RANGE: 500km (310 mi)
ENGINE: 1,500 HORSEPOWER V-12 FUEL INJECTION GENERAL DYNAMICS GD833 DIESEL
CREW: 4
ARMOUR: CLASSIFIED COMPOSITE
PRIMARY WEAPON: 120mm MG253 SMOOTHBORE GUN
SECONDARY WEAPON: 2X 7.62mm MACHINE GUNS; 1X 12.7mm (.50-CAL.) MACHINE GUN; POP-UP 60MM MORTAR

MERKAVA 1979-present

The Merkava is the product of domestic Israeli engineering, and urban warfare enhancements have led the world in practical application

After the Six-Day War of 1967, Great Britain and France suspended the supply of numerous weapons systems to Israel and the nation's military leaders were compelled to address their dependence on foreign arms sources. The development of a main battle tank became a cornerstone of Israeli efforts to achieve self-sufficiency. General Israel Tal led the drive to establish the Merkava program in 1968, and in 1979 the first of these main battle tanks was placed in service with the Israel Defence Forces (IDF).

Emphasis was placed on crew survivability, and the Merkava I introduced an unconventional hull design with the engine and diesel fuel tanks forward for additional protection of the crew. The turret, therefore, was located somewhat toward the rear of the chassis.



The Merkava IV, in development since 1999, introduced numerous upgrades when deployed with the Israel Defence Forces

The tank initially saw combat in Lebanon in 1982, and subsequent improvements have included urban warfare systems to directly address the close-quarter combat previously encountered, upgraded main armament from the 105mm L7 cannon to the 120mm MG251 smoothbore gun, and a heftier powerplant. The Merkava IV entered service in 2004 and its combat record in Lebanon has validated crew survivability despite revealing some vulnerability to anti-tank missiles. More than 2,000 of all variants have been produced to date.

Image: MathKnight and Zachi Evenor

PANZER 38(T) 1939-1945

A tank of Czech design, the Panzer 38(t) was adopted by the German Army

When Adolf Hitler's Germany annexed neighbouring Czechoslovakia in 1938, the Nazi war machine acquired a pair of valuable assets as the respected Skoda arms works and the engineering firm of Ceskomoravska Kolben-Danek (CKD) fell under German control. As the Nazis evaluated the newly acquired trove of Czech technology, design, and military industrial capacity, one of the most prominent procurements was the LT vz. 38 light tank.

The Germans appreciated its rugged, riveted design, reliability in the field, and the relatively heavy armament of the 37mm Skoda A7 main gun and a pair of 7.92mm ZB-53 machine guns, particularly since it outgunned the German Panzer I and II models then in service. It performed well during the Polish campaign of 1939 and the Battle of France the following year. As firepower rapidly increased during World War II, the small turret of the Panzer 38(t) was inadequate to mount a heavier main weapon, and production of the tank ceased in 1942, after more than 1,400 were built. However, the chassis was of such sound construction that it continued as a platform for numerous German armoured vehicles throughout the war years, including the Marder and Jagdpanzer 38(t) tank destroyers, the SdKfz 140 Flakpanzer, SdKfz 138 Grille, and numerous reconnaissance vehicles.

50 GREATEST TANKS

PANZER 38(T)
COMMISSIONED: 1939
ORIGIN: CZECHOSLOVAKIA
WEIGHT: 9.7 TONS
RANGE: 100km (62 mi)
ENGINE: 125 HORSEPOWER, 6-CYLINDER PRAGA EPA PETROL
CREW: 4
ARMOUR: 15-25mm
PRIMARY WEAPON: 37MM SKODA A7 GUN
SECONDARY WEAPON: 2X 7.92MM ZB-53 MACHINE GUNS

The Czech-designed Panzer 38(t) was appropriated by the German Army prior to World War II

"THE GERMANS APPRECIATED ITS RUGGED, RIVETED DESIGN, RELIABILITY IN THE FIELD, AND THE RELATIVELY HEAVY ARMAMENT OF THE 37MM SKODA A7 MAIN GUN"

Images: Alamy, Getty

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GREATEST TANKS

UNITED STATES

WORDS MICHAEL E. HASKEW

The development of tanks in the USA accelerated in the post-WWII years and resulted in iconic designs

Although the United States lagged behind European countries in the development of tanks during the early 20th century, its contributions steadily increased during and after World War II. Real combat experience influenced the design and the theory surrounding the use of armoured fighting vehicles on the modern battlefield. American designers and engineers incorporated the maxims of firepower, manoeuvrability, and armour protection in a series of models intended to counter the growing threat of the Warsaw Pact during the Cold War and provide optimal offensive capabilities for the US armed forces as they deployed from time to time around the globe.

The light or reconnaissance tank working in concert with the medium and heavy tank prevailed into the mid-century, but these designs ultimately gave way to the main battle tank as technology improved performance both offensively and defensively. The introduction of composite armour, incredibly accurate fire systems, state-of-the-art main armament, and specialised defences for urban warfare and desert deployment have been proven as outstanding enhancements in numerous theatres of operations.

M1A2 ABRAMS 1990-PRESENT

Enhancements to the M1 Abrams main battle tank have resulted in a proven weapons system that has dominated the battlefield

Even before its predecessor, the M1A1 Abrams main battle tank, compiled an outstanding combat record during the Gulf War of 1991, US military planners considered the extension of the Abrams platform with continuing upgrades and modernisation rather than committing substantial time and financial resources to the development of an all-new main battle tank. That reasoning has been validated with the success of the M1A2 Abrams.

Discussion surrounding an improvement program for the M1A1 began in 1988, and the M1A2 was approved by the US Army for production two years later. In 1992 the first production M1A2s were completed and in 1996 the General Dynamics Land Systems Tank Plant in Lima, Ohio, undertook the upgrade of approximately 1,000 M1Abrams tanks to the M1A2 configuration. Since then approximately 1,500 M1A2 tanks have been delivered to the US Army and nearly 700 have been exported to the armed forces of Saudi Arabia and Kuwait. The M1A2 is expected to serve with the US Army until at least 2050.

The Lima Army Tank Plant completed more than 600 upgrades to existing Abrams tanks from 1996 to 2001, while the number of new tanks completed on assembly lines was rather small. Significant changes included an improved turret, heavier suspension, upgraded armour protection, and enhanced nuclear, biological and chemical (NBC) defences. The installation of the Raytheon two-axis GPS-LOS primary sight, which replaced a single-axis sight, substantially improved the probability of an accurate first shot. Additionally, 240 of the M1A2 tanks were to receive the SEP (Systems Enhancement Package) by 2004, including the US Army Force XXI Battle Command, Brigade and Below Program (FBCB2), a coordinated combat management system allowing cooperating tanks to share the same view of the battlefield through radio interface. The TUSK (Tank Urban Survival Kit) may also be added to the M1A2 in the field, equipping the tank for close-quarter combat in the confines of an urban setting.

The M1A2 served as the spearhead of US armoured columns during Operation Iraqi Freedom in 2003, demonstrating superior firepower, manoeuvrability, and crew survivability during the battle for Nasiriyah and the swift occupation of the Iraqi capital of Baghdad.

50 GREATEST TANKS

M1A2 ABRAMS

COMMISSIONED: 1990 **LENGTH:** 9.83m (32ft 3in) **RANGE:** 426km (265 mi) **ENGINE:** AGT 1,500 LYCOMING GAS TURBINE GENERATING 1,500 HORSEPOWER **CREW:** 4 **ARMOUR:** COMPOSITE APPLIQUÉ: EQUIVALENT TO 960MM (37.7in) OF ROLLED STEEL **PRIMARY WEAPON:** 1 x 120mm M256 SMOOTHBORE GUN **SECONDARY WEAPON:** 2 x 7.62mm (.30CAL) M240 MACHINE GUNS; 1 X 12.7mm (.50CAL) M2HB MACHINE GUN

"THE M1A2 SERVED AS THE SPEARHEAD OF US ARMOURED COLUMNS DURING OPERATION IRAQI FREEDOM IN 2003"

M3 STUART LIGHT TANK 1941-1945

The Stuart Light Tank was the first American-built and crewed tank to engage enemy armour during World War II

The M3 was seen as a reliable tank by US and British armies

50 GREATEST TANKS

M3 STUART LIGHT TANK

COMMISSIONED: 1941
WEIGHT: 14.4 TONS **CREW:** 4
RANGE: 120km (75 mi)
ENGINE: 1 X CONTINENTAL W-670-9A SEVEN-CYLINDER RADIAL PETROL ENGINE GENERATING 250 HORSEPOWER OR TWIN CADILLAC V-8 OR GUIBERSON T-1020 DIESEL
ARMOUR: 10-65mm (.39-2.6in)
PRIMARY WEAPON: 1 x 37MM M6 GUN **SECONDARY WEAPON:** 2 x 7.62MM (.30CAL) M1919A4 BROWNING MACHINE GUNS

American engineers developed the M3 Stuart light tank as an infantry support and reconnaissance vehicle with exceptional speed and armour, in response to combat experience during World War I. Its 37mm main weapon was considered adequate at the time, however it was soon eclipsed during the rapid expansion of tank designs in World War II. The reliable and rugged M3 was tremendously popular with its American crews and British personnel who received it through the Lend-Lease program, and it was also supplied to the Soviet Red Army. The most common variant of the Stuart series was the M3A1, known to the British as the Stuart III or IV, depending on the powerplant.

While it was intended for reconnaissance and infantry support, the M3 inevitably became engaged with enemy tanks during the course of the war, and it was at a distinct disadvantage in most situations. However it proved more than adequate in its primary roles in both the European and Pacific theatres, where it was a match for the best tanks the Japanese deployed. The M3 and modified M5 remained in production through the end of World War II, but by the autumn of 1944 its successor, the M24 Chaffee, with the heavier 75mm gun, was entering service.

MAIN ARMAMENT

Although trials have been conducted with the 120mm L55 gun, the M256 L44 smoothbore, based on the German Rheinmetall design re-engineered for ease of production in the US, remains the primary weapon of the M1A2 Abrams main battle tank.

SECONDARY ARMAMENT

A pair of 7.62mm (.30cal) machine guns is installed on a skate mount at the loader's hatch and coaxially in the turret sighted with the main gun. A 12.7mm (.50cal) machine gun is mounted atop the turret beside the commander's hatch.

This M1A2 Abrams main battle tank exhibits upgraded systems that have characterised the continuation of the series

ARMOUR PROTECTION

Plates of depleted uranium are the foundation of the third generation composite appliqué armour of the M1A2 Abrams, which is based on the original Chobham protection. Its thickness is equal to that of 960mm, nearly 38 inches, of rolled homogeneous steel.

QUIET POWERPLANT

The AGT 1500 gas turbine powerplant is essentially a modified helicopter engine, running quietly and giving the M1A2 Abrams the nickname Whispering Death. It requires a less rigid maintenance schedule than diesel engines but is high in fuel consumption.

M26 PERSHING 1945-1953

The heavy M26 Pershing tank was developed as the American response to the German Tiger during World War II

The fighting prowess of the heavy German PzKpfw. VI Tiger tank was obvious to Allied commanders, and in tank versus tank combat there was no equal in the American arsenal. However as early as 1942 a US heavy tank design effort was underway.

In late 1944 production of 250 T26 heavy tanks, mounting a powerful 90mm gun, was authorised. Twenty actually reached the American 3rd and 9th Armored Divisions in Europe in January 1945, and in the spring the tank was formally christened the M26 Pershing. By the end of World War II about 200 M26s had been deployed to Europe. The tank continued in service with the US Army until it was replaced by the first of the Patton series in the early 1950s.

Ah M26 Pershing and crew deployed during the Korean War

50 GREATEST TANKS

M26 PERSHING
COMMISSIONED: 1944
WEIGHT: 46 TONS
RANGE: 161km (100 mi)
ENGINE: FORD GAF EIGHT-CYLINDER PETROL ENGINE DEVELOPING 500 HORSEPOWER
CREW: 5
ARMOUR: 50-102mm (1.97-4.02in)
PRIMARY WEAPON: 1 x 90mm M3 GUN
SECONDARY WEAPON: 1 x 12.7mm BROWNING M2HB (.50CAL) MACHINE GUN; 2 x 7.62mm (.30CAL) BROWNING M1919A4 MACHINE GUNS

50 GREATEST TANKS

M48 PATTON
COMMISSIONED: 1953
WEIGHT: 46.25 TONS
RANGE: 465km (290 mi)
ENGINE: CONTINENTAL AVDS-1790-2 V-12 DIESEL ENGINE GENERATING 750 HORSEPOWER
CREW: 4 **ARMOUR:** 13-120mm (.5-4.7in) **PRIMARY WEAPON:** 1 x 90mm M41 GUN **SECONDARY WEAPON:** 1 x 7.62mm (.30CAL) M73 MACHINE GUN; 1 x 12.7mm (.50CAL) BROWNING M2 MACHINE GUN

M48 PATTON 1953-1993

Anticipating the need to counter Soviet armour on European battlefields during the Cold War, the US developed this main battle tank

Although the M48 Patton tank was the third in the American post-World War II series to bear the name of the famed General George S. Patton, Jr., it was a completely new design that built on experience during the Korean War while considering ease of future upgrades and reasonable expense. Specifications were issued in 1951, and two years later the M48 entered production.

During a run that extended six years, more than 12,000 were completed. The M48 became a mainstay of numerous NATO and allied countries, seeing combat with Pakistani forces in 1965 and taking substantial losses in combat against Indian Army Centurion tanks. Both Israeli and Jordanian forces deployed the M48 during the Six-Day War, and the US used over 600 during the Vietnam Conflict.

***Below:** US Marines ride aboard an M48 Patton tank in Vietnam in 1966. The Patton performed well in the infantry support role*

50 GREATEST TANKS

M3 GRANT/LEE
COMMISSIONED: 1941
WEIGHT: 26.5 TONS
RANGE: 240km (160 mi)
ENGINE: GENERAL MOTORS 6046 12-CYLINDER DIESEL COMBINING TWO GM 6-71 ENGINES GENERATING 420 HORSEPOWER
CREW: LEE 7; GRANT 6
ARMOUR: 12.5-76mm (.49-3in)
PRIMARY WEAPON: 1 x 75mm M2 L/31 CANNON
SECONDARY WEAPON: 1 x 37mm M6 CANNON; UP TO 3 x 7.62mm (.30CAL) BROWNING M1919A4 MACHINE GUNS

An M3 Grant tank (left) and Lee tank (right) are pictured in service with the British army in the desert in 1942

WALKER BULLDOG 1953-1998

The M41 Walker Bulldog light tank replaced the World War II-era M24 Chaffee by the early 1950s

The M41 Walker Bulldog light tank was manoeuvrable, rather basic to operate, and packed a considerable punch with its main 76mm gun. Developed from the T37 program specifically to replace the M24 Chaffee, it entered service too late for the Korean War but served with South Vietnamese forces in the Vietnam War and was widely exported.

South Vietnamese troops train with the M41 Walker Bulldog, which performed well against Soviet-made tanks during the Vietnam War

WALKER BULLDOG

COMMISSIONED: 1953
WEIGHT: 26 TONS
RANGE: 165km (103 mi)
ENGINE: CONTINENTAL AOS-895-5 SIX-CYLINDER PETROL ENGINE GENERATING 500 HORSEPOWER **CREW:** 4
PRIMARY WEAPON: 1 x 76mm M32 GUN
SECONDARY WEAPON: 1 x 12.7mm (.50CAL) BROWNING M2 MACHINE GUN; 1 x 7.62mm (.30CAL) BROWNING M1919A4 MACHINE GUN

M3 GRANT/LEE 1941-1945

This tank served as an immediate response to the growing threat of German armoured firepower in North Africa

When German forces in North Africa during World War II introduced tanks with heavy 50mm and 75mm guns, tipping the balance of power and taking a heavy toll in British tanks, the United States rejected the idea of building British tanks in American factories and instead offered the alternative of the M3 Grant/Lee tank. This hybrid blended both old and new technology but served the purpose as a stopgap measure that gave the British a fighting chance in the desert war. American engineers incorporated a sponson mounted 75mm gun into the M2 tank chassis and maintained the 37mm gun in a small turret. The design was unusual but necessary since there was no turret in production at the time capable of mounting the heavier weapon.

The production M3 without modification was called the General Lee, and the British purchased large numbers of the tank, removing the commander's cupola and lengthening the turret in some of them to accommodate radio equipment. These were known as the General Grant. The M3 became operational in late 1941 and made its combat debut during the 1943 Battle of Gazala. Although its tall silhouette made a tempting target for enemy gunners, the M3 did serve its purpose until giving way to the M4 Sherman medium tank.

The M3 Grant and Lee were named after Union general Ulysses S. Grant and Confederate general Robert E. Lee

Images: Alamy, Getty

GREATEST TANKS

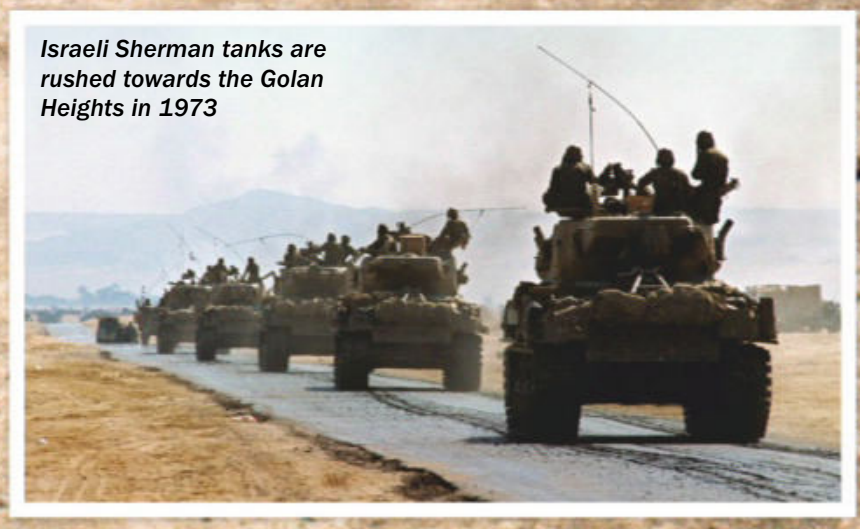
GOLAN HEIGHTS

Surprised, outnumbered and with outdated equipment, the Israeli defence of the 'Valley of Tears' in 1973 became a classic of modern tank warfare

WORDS **STUART HADAWAY**

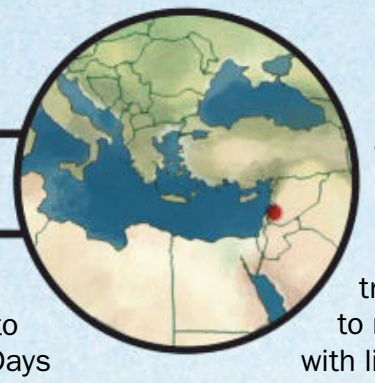
"THE ATTACK WAS PART OF A TWO-PRONGED ASSAULT ON ISRAEL, WITH THE EGYPTIAN ARMY HAVING ATTACKED ACROSS THE SUEZ CANAL ONLY 15 MINUTES BEFORE"

Left: Syrian tanks destroyed during the Yom Kippur War



Israeli Sherman tanks are rushed towards the Golan Heights in 1973

GOLAN HEIGHTS, ISRAELI-SYRIAN BORDER OCTOBER 1973



At 14:05 on 6 October 1973, the Syrian Army unleashed a massive assault on the Israeli-occupied Golan Heights. The attack was part of a two pronged assault on Israel, with the Egyptian Army having attacked across the Suez Canal only 15 minutes before. Both countries, plus various other Arab allies, were keen to repay the Israelis for their humiliating defeat during the Six Days War of 1967, and regain both their national pride and lost territory.

In 1967 the Israelis had fought a fast, aggressive war with strong armoured columns and overwhelming air power hammering the Egyptian and Syrian forces, and taking control of both the Sinai Desert and the Golan Heights. The Sinai created a buffer zone to their south, while the Golan Heights created another on their north-eastern border with Syria. The Heights, 20-25 miles in length, dominate north Israel, and their loss to an enemy force would allow them to not only observe but also potentially fire upon large areas of that country. Both sides tried to take lessons away from the Six Days War, each with mixed success.

The Syrian Army had, up to that point, been primarily used for internal policing operations. During the 1967 war they had been an almost entirely infantry force, with little experience or doctrine for fighting other modern armies. After the war, and especially since the rise to power of Hafez al-Assad in 1970, massive investment in Soviet weapons and systems had modernised the army to an incredible extent, with massed armoured formations and considerable battlefield anti-aircraft capability. The latter included SAM-2 and SAM-6 systems, ZSU-23-4 anti-aircraft mobile guns, and extensive use of SAM-7 man-portable air defence systems. These, along with large numbers of 9M14M Malyutka man-portable anti-tank systems, gave the infantry substantial specialist firepower with which to counter the traditional Israeli air and tank superiority. In all, it was a large, well-equipped, and professional force. However the troops themselves, while undeniably brave and committed, still lacked training and experience. They tended to rigidly stick to planned movements with little flexibility or initiative. The officer ranks (particularly at mid- to high-level) were filled with men who were selected for political rather than military reasons.

The Israeli Defence Forces, on the other hand, were small, mostly part-time, and equipped with dated weapons. The army was based around a professional corps of officers and NCOs, while the other ranks consisted of conscripts completing their national service. After the end of their full-time terms, the troops were committed to one month per year training. Overall, that level of training was excellent. The system should have led to organisational weaknesses, but the nature of Israeli society worked in favour of unit cohesion. Reservists remained in the same unit, so the men would work together regularly over many years. Equally, in such a tiny country, many of the men would know each other in their civilian lives, and bonds of comradeship would be built

Israeli Centurion 'Sho't' tank on the advance

OPPOSING FORCES

SYRIA

LEADER: Major General Mustafa Tlas

TANKS: 800

INFANTRY: 60,000

ARTILLERY: 800

RESERVE TANKS: 600

VS

ISRAEL

LEADER: Brigadier General Rafael Eitan

TANKS: 180

INFANTRY: 3,000

ARTILLERY: 44

RESERVE TANKS: 120

50 GREATEST TANKS

CENTURION

COMMISSIONED: 1946
WEIGHT: 51 TONS
RANGE: 50 MILES (80 KM)
CREW: 4
ENGINE: ROLLS-ROYCE METEOR
ARMOUR: 51-52mm
PRIMARY WEAPON: 105mm L7 RIFLED GUN, 20 PDR (84mm) RIFLED GUN, 17 PDR (76.2mm) RIFLED GUN
SECONDARY WEAPON: XCO-AXIAL .30 CAL BROWNING MACHINE GUN

outside of their training as well. The smallness and vulnerability of the country also had an added effect in motivating the troops, who knew that any failure on their part could lead to the entire country being overrun.

The 1967 war had left the Israelis riding high, after their use of air power and armoured columns had inflicted heavy damage on their enemies on all sides. But their victory also led to complacency, and to learning some of the wrong lessons. On a strategic level, the traditional Israeli doctrine of launching hard pre-emptive strikes while their enemies were still mobilising, had worked. Coupled with aggressive battlefield tactics, this forward stance compensated for their lack of numbers and of depth, and after 1967 the Israelis erroneously believed they would always have this luxury.

On a tactical level, the performance of their armour had led to a belief that tanks conquered all, regardless of the condition of their supporting arms. Tanks became the elite arm, while investment in artillery and infantry was cut back, leaving (although they would not know it until it was too late) their tanks highly vulnerable to enemy infantry with anti-tank weapons. Tactics and innovation were stifled under the belief that their superiority over the Arabs would last for decades, a fallacy that stretched to the air force, who also rested on their laurels. Both arms would be in for a rude awakening.

In 1973 the Israelis would be forced into a war for which they had not prepared. Syrian and Egyptian preparations were conducted in such a way that Israel's senior military and political ranks only began to suspect something was wrong a few weeks before the blow fell. Even then, the signals were uncertain, and the Israelis only began to mobilise a few hours before the Egyptian attack. They were immediately put into an unfamiliar, defensive and reactive situation.

On the Golan Heights, Israeli defences began with an anti-tank ditch, 6m wide and 4m deep, and minefields along the "Purple Line" – the ceasefire line from 1967. Seventeen strongpoints, supported by pillboxes, were spread along the ditch as a piquet line – each held a section or two of infantry, and was supported by a section of three tanks. A few kilometres behind them rose the Golan Heights, steep and rough terrain that was in many ways appalling for mobile warfare. Only a few main roads ran across them, each dominated by higher ground. The Israelis had

"SYRIAN AND EGYPTIAN PREPARATIONS WERE CONDUCTED IN SUCH A WAY THAT ISRAEL'S SENIOR MILITARY AND POLITICAL RANKS ONLY BEGAN TO SUSPECT SOMETHING WAS WRONG A FEW WEEKS BEFORE THE BLOW FELL"

prepared defensive positions all along the Heights, and knew the ground well, which would be an inestimable advantage. The line was held by two infantry battalions and two armoured brigades, supported by 11 artillery batteries (44 guns). The two armoured brigades (from the 36th Armoured Division) were the backbone of the defence, with 177 tanks between them. One, the Barak Brigade was on the line, while the 7th Armoured Brigade was in reserve, having only just arrived.

The Arab attack began on 6 October 1973 – the Jewish festival of Yom Kippur. Attacking on a religious holiday was supposed to delay Israeli reactions, but this is debatable; while many soldiers were on leave, they and the reservists were also all at home, and thus easy to reach with calls to mobilise. At 1405hrs the Syrians began an hour-long bombardment of the Golan Heights, during which their columns began the advance across the open low ground in front of the Heights. Three infantry divisions, each supported by an armoured brigade, each drove down their own road.

The 7th Infantry Division advanced down the road to Wasset in the north, the 9th Infantry Division down the central road to Nafekh, and in the south the 5th Infantry Division advanced on Juhader. In all, some 60,000 infantry, 1,400 tanks, and 800 artillery pieces were available to be thrown into the fight.

Each column was led by MT-55 bridge-laying tanks, who were to create as many crossing points over the anti-tank ditch as possible. Here, superior Israeli training had an immediate effect. Despite pitting their small numbers of Centurion tanks against the larger numbers of comparable T-54 and T-55 and much more modern T-62 armour, the Israelis were able to take up their prepared positions and use their skill and experience to pick off Syrian tanks at 2,000m range. In particular, during the opening hours they took a heavy toll on the bridging units. Following rigid instructions and lacking individual initiative, the Syrian columns became bunched up and easy targets as they waited to cross the few remaining bridges. Bulldozers came forward to create ramps, but progress was slow.

Through the afternoon Syrian numbers west of the Purple Line increased, as tanks and mechanised infantry crossed. The tanks and infantry, with their hand-held anti-tank weapons, took an increasing toll on the Israelis. In late afternoon the 7th Armoured Brigade was rushed into the line; the Barak Brigade (plus

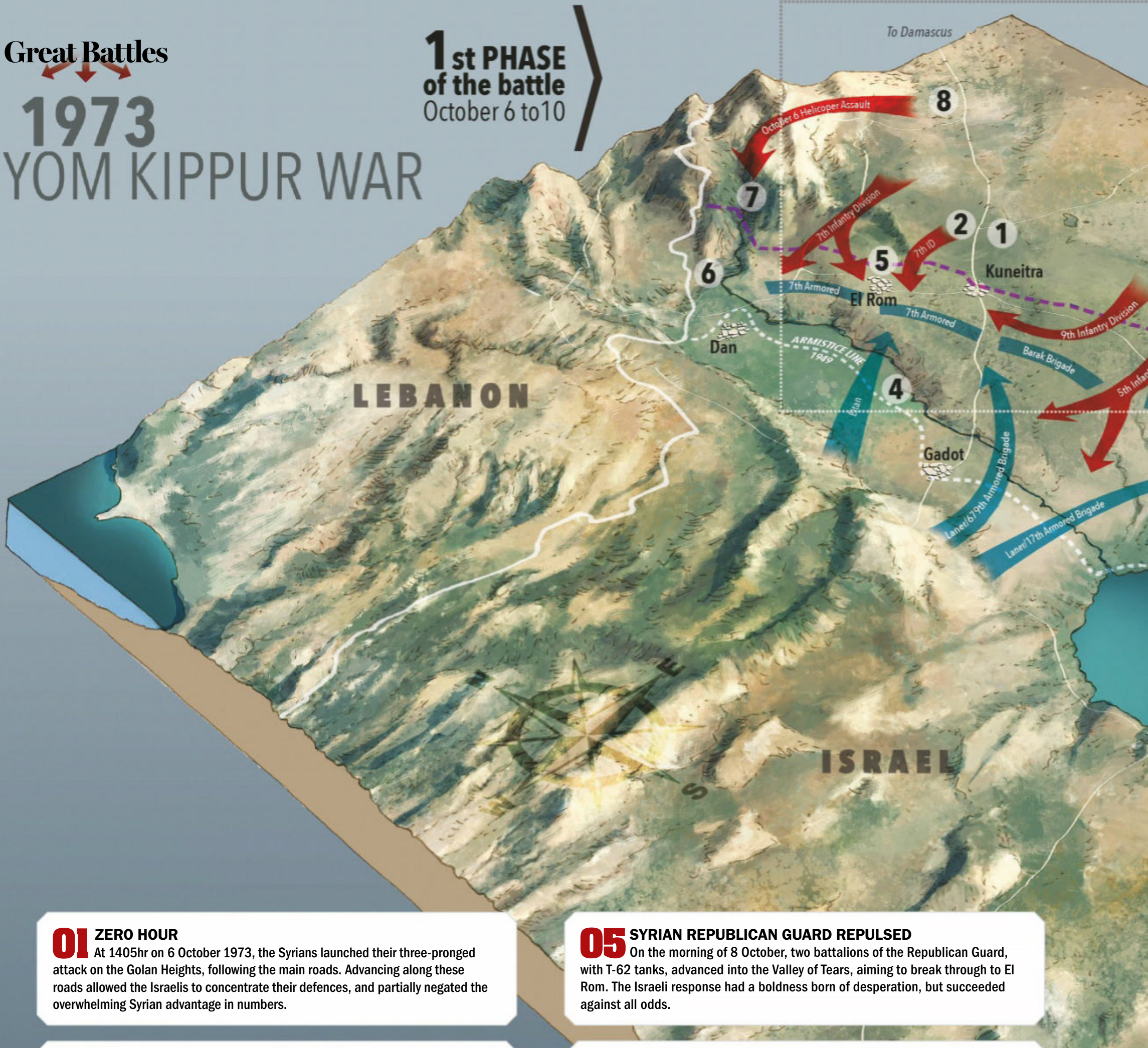
***Above:** An Israeli military column on its way to Syria*

Israeli artillery in action on the Golan Heights. Useful for interdicting supply convoys, artillery fire was less effective against tanks

Great Battles

1973 YOM KIPPUR WAR

1st PHASE of the battle
October 6 to10



01 ZERO HOUR
At 1405hr on 6 October 1973, the Syrians launched their three-pronged attack on the Golan Heights, following the main roads. Advancing along these roads allowed the Israelis to concentrate their defences, and partially negated the overwhelming Syrian advantage in numbers.

02 VALLEY OF TEARS
Overnight on 6/7 October, and over subsequent days, Syrian armoured formations were thrown into the natural depression between Mount Hermonit and the Booster. Israeli forces on the high ground either side had a natural advantage, although Syrian numbers came close to winning through.

03 BRINK OF SUCCESS
By dawn on 7 October, the Syrians had broken through to Ramat Magshimim, and were poised to either swing north and cut off the Golan Heights, or south and around the Sea of Galilee into the heart of Israel. However, Israeli reinforcements were rushed to block them.

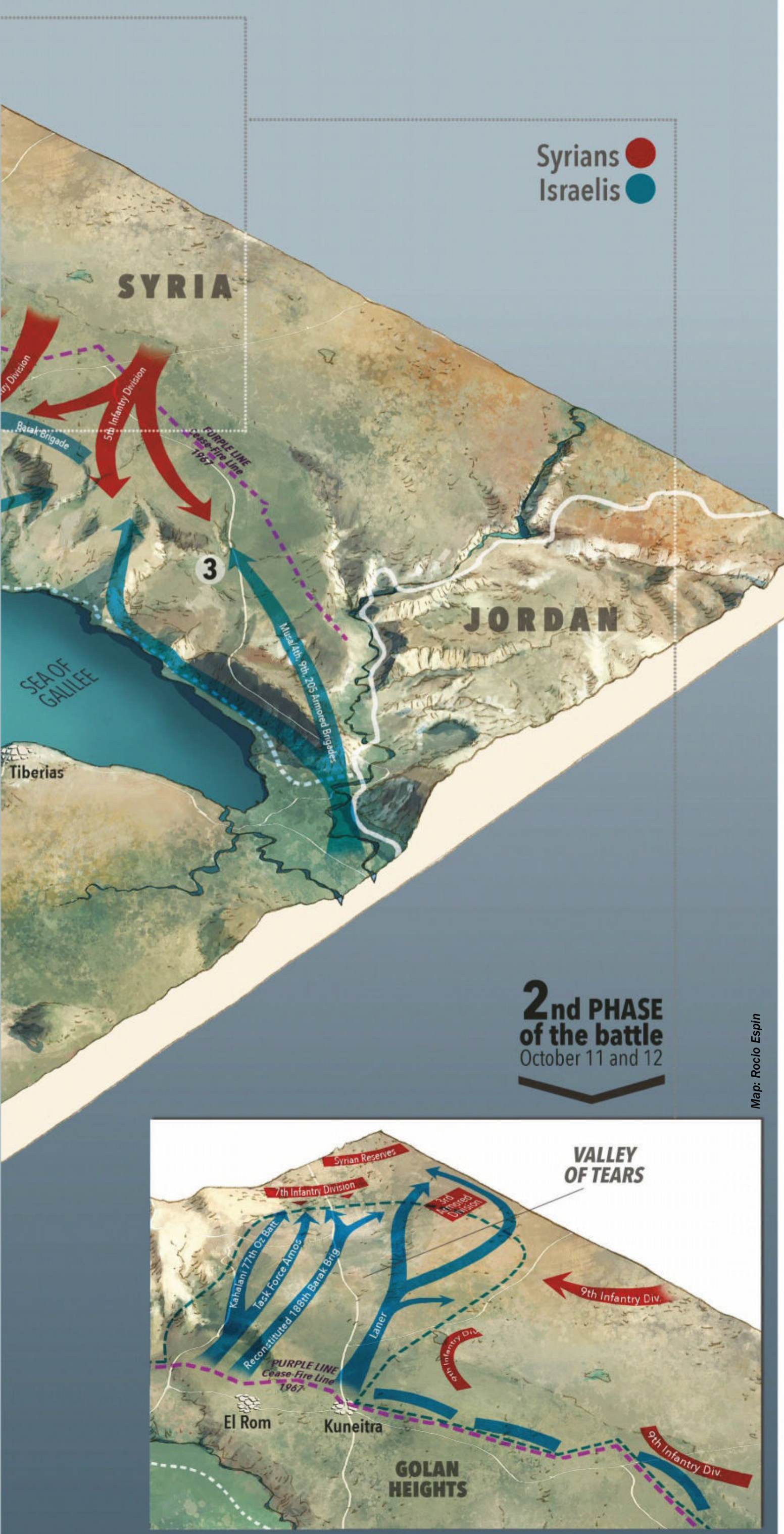
04 HIGH TIDE IN THE CENTRE
On the afternoon of 7 October Syrian tanks over ran the HQ of the Israeli 36th Armoured Division. Sentries and staff officers used bazookas to knock out Syrian tanks until relieved by the advancing 679th Reserve Armoured Brigade. Slowly, the Syrians were now pushed back.

05 SYRIAN REPUBLICAN GUARD REPULSED
On the morning of 8 October, two battalions of the Republican Guard, with T-62 tanks, advanced into the Valley of Tears, aiming to break through to El Rom. The Israeli response had a boldness born of desperation, but succeeded against all odds.

06 ISRAELIS STRIKE BACK
On 11 October the Israelis massed most of their forces in the north, including units that had been fighting for five days straight. They struck east, and although Israeli tanks suffered from a lack of infantry support in the rocky terrain, they managed to break though the Syrian lines.

07 THE EYES OF ISRAEL
The Israeli intelligence and observation post on Mount Hermon had been captured in the opening hours of the war. This blinded them to events and troop movements deeper in Syria, intelligence that would be sorely missed during the subsequent fighting. On 22 October this vital post was recaptured by Israeli infantry.

08 BEIT JANN: ISRAELI HIGH TIDE
By 14 October the Israelis had advanced within artillery range of Damascus. Content that this gain placed suitable pressure on the Syrian government, they switched their main focus to the Sinai campaign. Over the next 10 days, numerous Arab counter-attacks on this salient would be repulsed.



one battalion of the 7th) now held the line from the Jordanian border north to Kuneitra, and the 7th Armoured Brigade moved into positions from Kuneitra north to Mount Hermon and the Lebanon border. The reorganisation was not a moment too soon, as by nightfall the Syrians had over 450 tanks west of the Line, while the Barak Brigade was reduced to just 15 operational tanks.

No respite came with dusk, as the Israelis had expected and hoped. Instead, the Syrians fought on. Their modern Soviet tanks were equipped with night vision gear for the drivers, gunners, and commanders, while infra-red searchlights were used to pick out Israeli tanks for targeting. On the other side, only the commanders of the Israeli tanks had binoculars with basic infra-red capability. They were forced to rely on parachute flares which were of limited use. However, as ranges reduced to a hundred metres or less, the darkness became less of an issue, and Israeli training and marksmanship again proved superior, especially in the north. As the Syrian 7th Infantry Division advanced up the road to Wasset, they became concentrated into a valley between Mount Hermonit to the north and high ground known as the Booster to the south. By dawn on 7 October, over a 100 Syrian tanks had been knocked out in this area, which became known as the Valley of Tears.

In the south, the 5th Infantry Division had more success, and had pushed as far as Ramat Magshimim, with clear views over the Sea of Galilee. The Syrian 1st Armoured Division was sent forward to exploit the breakthrough, even as the Israelis scrambled to bring up the 679th Reserve Armoured Brigade to plug the gap. Attempts by the Israeli air force to intervene met with bloody failure as each wave of aircraft ran into the umbrella of SAMs. However, as the Syrians pushed onwards towards the Sea of Galilee, they moved out of range of their larger, fixed position SAM systems, and increasingly suffered aerial attack. Further north, Syrian troops briefly over ran the headquarters of the Israeli 36th Armoured Division at Nafekh.

By now, Israeli reinforcements were coming into play. Platoons (three tanks) and companies were rushed into the line as they arrived, acting independently as they manoeuvred and counter-attacked with an almost instinctive tactical co-ordination born from years of training together. The quality of the Israeli officers and NCOs – their tank commanders – proved greatly superior to the Syrians, who seemed incapable of

“THEIR MODERN SOVIET TANKS WERE EQUIPPED WITH NIGHT VISION GEAR FOR THE DRIVERS, GUNNERS, AND COMMANDERS, WHILE INFRA-RED SEARCHLIGHTS WERE USED TO PICK OUT ISRAELI TANKS FOR TARGETING”

Towards the end of the War, both sides received resupply from foreign airlifts, Soviet and US

responding to these pin-prick attacks. As Syrian casualties mounted, their momentum slowed and faltered. In the late afternoon the Syrian high command met to take stock, and in a shocking decision ordered their front line forces to stop while they did so. In one move, the Syrians lost the initiative, and their momentum in the south.

That night, the Syrians again attacked in both the north and the south. In the Valley of Tears, around 40 Israeli tanks faced over ten times their number, but held the line. In both regions, again and again Israeli marksmanship and flexibility countered Syrian numbers, using their knowledge of the ground and aggressive doctrine to close with the enemy, strike hard, and then reposition before the Syrians could react. The fighting continued through the 8 October with the battle becoming scrappier as units on both sides increasingly needed refuelling and resupply. For the Syrians, this meant bringing trucks and tankers forward along roads zeroed in by Israeli artillery and, increasingly, Israeli aircraft that were

"IN THE VALLEY OF TEARS, AROUND 40 ISRAELI TANKS FACED OVER TEN TIMES THEIR NUMBER, BUT HELD THE LINE"

adapting their tactics to meet the new threat environment. For the Israelis it meant bringing forward supplies to small, widely dispersed, and fast moving formations, often operating behind the leading Syrian units.

Into the night on the 8/9 October, the Syrians continued to hold their ground, allowing both sides a modicum of rest after three days' continuous fighting. In the early hours of 9 October, they unleashed a massive bombardment against the Israeli lines opposite the Valley of Tears, having decided to maintain their attacks along all three axes. This would be a fatal error. Concentrating their dwindling reserves in the south could have led to a decisive breakthrough, but instead troops continued to be poured in to reinforce failed attacks. Having said that, the Israeli situation in the Valley was tenuous. The 7th Armoured Brigade had started the war with 105 tanks, but now had just 15 left operational. By the time the bombardment lifted to reveal two full battalions of the elite Syrian Republican Guard advancing, it had been reduced to only seven, all perilously low on ammunition.

One advantage the Israelis enjoyed over the Syrians was an established support network just behind their lines. As their tanks were knocked out, most were recovered and pulled back to nearby depots for repair. Of the 250 or so Israeli tanks damaged enough to be put out of action during the fighting on the Golan Heights, around 150 were patched up and returned to the fight (some multiple times), while casualties among most crews were mercifully light. One exception was tank commanders. In keeping with the élan of being an elite arm, Israeli tank commanders had developed the habit of riding their tanks into

Knocked out Syrian T-62s on the Golan Heights

GOLAN HEIGHTS

The remains of Syrian tanks following the conflict

An Israeli Centurion tank, now a memorial to the fighting at Tel Saaki

action sitting high in their hatches, terribly vulnerable to enemy fire. Some two-thirds of Israeli Armoured Corps casualties would be among their tank commanders. But enough tanks were repairable and crews available that patched up tanks could be sent quickly back into the fight, and this is what turned the tide for the 7th Armoured Brigade. A scratch force of 13 tanks was gathered at a depot and sent forward, arriving in time to hit the Republican Guard in the flank, and knock out 30 Syrian tanks in just a few minutes. The surprised Syrians assumed this was the spearhead of an Israeli counter-attack and fell back.

In the south, increasing numbers of arriving Israeli reserve units were stabilising the line, and beginning to push the exhausted Syrians back. By the end of 10 October 1973 the Israelis had all but regained their original positions along the Golan Heights. Against all rational expectations, the Israelis had recovered from the surprise blow, and despite being outnumbered by more modern equipment, had not only stabilised the line but even begun to regain lost ground. Indeed, that night their forces were re-arranged, and two of the three Israeli armoured divisions now on the Golan Heights moved north ready for a counter-attack across the Purple Line.

On the morning of 11 October, the Israelis struck back. By attacking in the north they threatened to cut off the forces still threatening the southern portions of the line and the Sea of Galilee. Unable to halt the advance, the Syrians were forced to retreat. An Arab counter-attack the following day was led by the Iraqi 3rd Armoured Division, who were repulsed after losing 80 of their own tanks for not a single Israeli loss. On 14 October the Israelis had reached to within artillery range of Damascus, and here they dug in, switching their strategic focus the following day to the Sinai, where the Egyptians were still fighting. They repeatedly resisted counter-attacks by Syrian, Iraqi and Jordanian forces for the next week, until a cease-fire was agreed on 24 October. The Arab world had lost around 1,400 tanks destroyed, and 8,000 men killed or wounded.

The Israeli losses were far lighter in material, with almost all of the damaged tanks being salvaged and repaired, while around 1,200 men had been killed or wounded.

The Israelis had been caught badly off guard by the initial attacks, which had been specifically devised to counter their traditional reliance on armour and air power. Their battlefield doctrine had been exposed as being dangerously flawed, but the situation had been saved by the better training and experience of their tank crews and officer corps. Their marksmanship, aggressive tactics, and ability to operate as small, independent yet broadly co-ordinated units on the battlefield had allowed them to literally run rings around the Syrians, who were tied to a rigid focus on following set plans without the use of personal initiative. It had been an epic clash of two different military cultures as well as one of technology, and it would be keenly studied by both the Soviets and the West in an attempt to learn lessons for any future clashes on the plains of Germany.

Images: Alamy, Rocio Espin, Getty

Heroes of the Medal of Honor

ROBERT H. McCARD

This US Marine Corps Gunnery Sergeant gave his life to save his tank crew during the fight for the Pacific island of Saipan in World War II

WORDS **MICHAEL E. HASKEW**

Gunnery Sergeant Robert H. McCard was 25 years old, a fine example of the dedicated, rock-solid non-commissioned officers that were the backbone of the United States Marine Corps. McCard did not wait for his country to enter World War II to become a Marine, enlisting three years earlier in December 1939.

By the spring of 1944, McCard was a combat veteran, a platoon sergeant in Company A, 4th Tank Battalion, 4th Marine Division, who had participated in the seizure of the island of Kwajalein in the Marshalls group that January. While the eyes of the world were on the events in French Normandy as Allied soldiers assaulted Hitler's Fortress Europe, McCard was on the other side of the globe in the Pacific, engaged in a life-and-death struggle against the Japanese occupiers of Saipan, the administrative centre of the Marianas archipelago.

On the island road to the Japanese homeland, the Marianas were 1,931 kilometres (1,200 miles) from the enemy capital of Tokyo. For American war planners possession of the Marianas, including Saipan and two other large islands in the group, Guam and Tinian, meant staging areas for further progress toward victory. More importantly, in the short term, it meant airfields that were large enough to accommodate the latest generation of US strategic bomber, the Boeing B-29 Superfortress, and within the operational range of the big, four-engine aircraft to strike Japan's home islands. The Superfortresses would rain death and destruction, eroding Japanese will and capacity to wage war. The capture of the Marianas was codenamed Operation Forager. Its first significant assault at Saipan became Operation Tearaway.

So, in the stifling afternoon heat of 16 June 1944, D+1 of Operation Tearaway, McCard was buttoned up inside one of several M4A2 Sherman medium tanks along with the four members of his crew, advancing toward the eastern slope of an otherwise obscure ridge designated as the O-1 phase line, the initial objective of the 2nd and 3rd Battalions, 25th Marine Regiment, 4th Division. Their immediate mission was to silence a battery of four Japanese Type 88 75mm antiaircraft guns that were actually dual-purpose – also deadly against American tanks when depressed to fire horizontally. When the furious fight was over, McCard had heroically given his life while covering the escape of his crew from a deathtrap, a selfless act that earned him a posthumous Congressional Medal of Honor.

When the order arrived for the tanks of the 4th Battalion to move forward, they had been ashore on Saipan only a day. A thundering preparatory barrage of naval gunfire had commenced at 5.42 on the morning of 15 June, and just over an hour later as the rain of steel intensified, Vice Admiral Richmond Kelly Turner, commanding the amphibious forces, barked, "Land the landing force!" Large transport craft known as LSTs (Landing Ship, Tank) moved into positions 1,143 metres (1,250 yards) behind the line of departure, and the Marines climbed down cargo nets into LVTs (Landing Vehicle, Tracked), amphibious vehicles that would churn toward the invasion beaches on the island's western shore. At 8:40am, the LVTs began their hazardous runs.

The enemy reception for the Marines of the 2nd and 4th Divisions was hot. Japanese artillery, mortar and small-arms boomed and crackled as they came ashore, and strong currents pushed some landing craft away from their assigned sectors. From concealed positions, the 23,000 Japanese defenders of Saipan unleashed a torrent of fire.

The 4th Tank Battalion attempted to come ashore at Saipan throughout the afternoon. Just getting ashore was an ordeal. Along with the challenges of a substantial coral reef and swift currents, the Japanese kept up a murderous fire, and the situation quickly became confused. Underwater demolition teams had blown up obstacles and scouted the beaches for favourable areas for the tanks to come ashore. They recommended two methods. The first was to transit the channel leading to Blue Beach 1 and land the tanks directly on the shore from their LCMs (Landing Craft, Mechanized). The second, more hazardous, was to deposit the tanks on the coral reef offshore, primarily near Yellow Beach, requiring them to reach the beaches under their own power.

Company A was offloaded on the coral reef and forced to negotiate nearly 640 meters

"SERIOUSLY WOUNDED... AND WITH HIS SUPPLY OF GRENADES EXHAUSTED, GUNNERY SERGEANT McCARD DISMANTLED ONE OF THE TANK'S MACHINE GUNS AND FACED THE JAPANESE FOR A SECOND TIME TO DELIVER VIGOROUS FIRE..."

Medal of Honor citation

Gunnery Sergeant Robert H. McCard received a posthumous Medal of Honor for action on Saipan during World War II

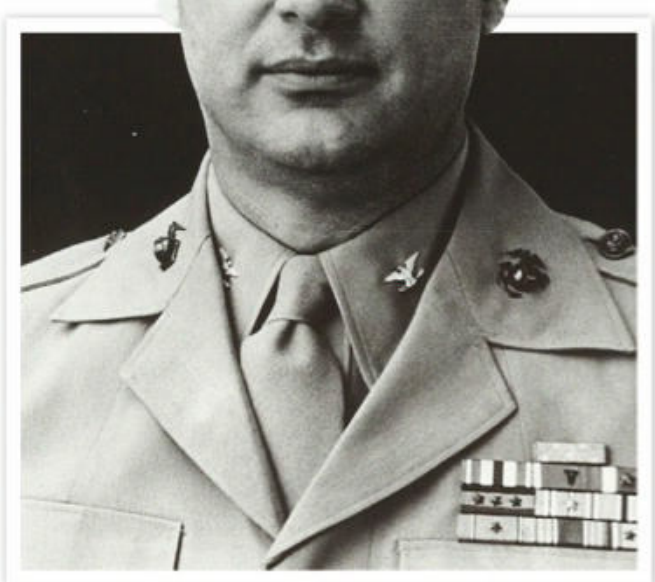
M4 SHERMAN

COMMISSIONED: 1941
WEIGHT: 31 TONS
RANGE: 120 miles **CREW:** 5
ENGINE: 317KW (425HP)
ARMOUR: 38-89MM
PRIMARY WEAPON: 75MM M3 L/40 MAIN GUN
SECONDARY WEAPONS: BROWNING M2HB, X2 BROWNING M1919A4 MG

“MARINE SGT. ROBERT H. McCARD, 33 [SIC], WAS KILLED IN ACTION IN THE SOUTH PACIFIC AREA, HIS WIFE, MRS. LISETTE McCARD OF BELLEVILLE, HAS BEEN NOTIFIED”

St. Louis Post-Dispatch, August 10, 1944 edition

U.S. Marine flame-throwing tank attacks a Japanese pillbox on Saipan. In mid-ground a Marine watches from a foxhole



(700 yards) of churning water to reach Blue Beach 2, losing a pair of Shermans when they were swamped and saltwater rendered their electrical systems useless. A third was damaged as it tried to tow another tank ashore. Nearby, only four of Company B’s 14 tanks reached the beach, some of them falling into offshore shell holes – unforeseen hazards of the pre-invasion bombardment.

As soon as it was practical on D-Day, the Company A tanks assembled and lumbered forward to support the 1st Battalion, 25th Marines locked in combat near Agingan Point.

Left: Lieutenant Colonel Justice Chambers, who ordered the 16 June 1944, Saipan attack, received the Medal of Honor for heroism at Iwo Jima

Arriving just in time to help fend off an attack from two companies of Japanese infantry, the Shermans erupted with a curtain of fire from their 75mm main guns and their secondary .50-calibre and .30-calibre Browning machine guns, driving into the exposed enemy flank. The attack was shattered, and Japanese bodies littered the ground. The Shermans roared across Agingan Point, engaging bunkers and machine-gun nests with devastating efficiency and allowing the 1st Battalion to continue its advance. No tanks were lost in the engagement, although one threw a track and became lodged in a crater. It was recovered hours later. Overnight, a Japanese counterattack attempted to wipe out the

***Left:** Marines on Saipan take cover behind the protective hulk of an M4 Sherman medium tank amid withering Japanese fire*

The rusting shell of an American M4 Sherman tank lies just off the beach at Saipan decades after the battle

American beachhead but was repulsed with heavy losses.

On the morning of the 16 June, sluggish progress was made toward Aslito Airfield, a primary objective of the 24th and 25th Marines. As their artillery swung into action against Japanese strongpoints, accurate counter battery fire disabled numerous Marine howitzers, but most of these were back in action later in the day. Slogging through swamps and jungle terrain, the Marines encountered heavy resistance, and the battalion commanders radioed for tank support. Before noon, Lieutenant Colonel Justice M. Chambers, commanding the 3rd Battalion, 25th Marines, called upon his infantrymen of Company L and six Shermans of Company A to eliminate harassing rifle fire from Japanese soldiers. The enemy was hidden in the jungle surrounding an assembly area near the troublesome ridgeline, along with the four 75mm Type 88 guns and a pair of mountain howitzers that were lobbing shells into the area and making any activity hazardous.

At approximately 12.15pm, McCard and the rest of the 4th Tank Battalion buttoned up their Shermans, turret roofs painted fluorescent yellow for recognition from the air to prevent friendly planes from firing on them, and moved out. They would bring welcome firepower to the effort to clear the ridge and capture the airfield. The tank-infantry teams went to work, swiftly silencing five machine-gun nests, taking out the two mountain howitzers, and killing about 60 Japanese soldiers. Company L then moved to assist the 2nd Battalion, 25th Marines in the battle with the Type 88s and, as it was soon discovered, three more machine-gun nests spewing deadly fire.

McCard's tank platoon headed up the eastern slope of the ridge as well. In the scramble for position, his Sherman became separated from the others and was pounded by the Japanese guns. The tank was immobilised, isolated, and silhouetted against the sky – a proverbial sitting duck. A tanker from Company C dodged 75mm rounds that hit the road in front of his Sherman and later remembered, "I'm shifting up gears, and I look off to the left and I could see a burning tank right on the skyline!"

That burning tank was McCard's, disabled but still full of fight. The crew returned fire with its own 75mm gun, and the tank's machine guns kept Japanese infantry at bay, but enemy shells continued to slam into the Sherman. Time was running out. "Take off! Out the escape hatch!" McCard bellowed, and his crewmen slid out of the tank, into the mud, and along to safety. From the turret, the tough gunnery sergeant peppered the enemy with hand grenades to cover their retreat. Grievously wounded, he ducked back inside the smoking Sherman and removed a coaxial .30-calibre machine gun, re-emerging to fire until he was overwhelmed. Before he died, McCard killed 16 Japanese soldiers and wounded several others. His heroism bought time for his fellow Marines, and the enemy guns were later put out of action.

Saipan was declared secure on 9 July, after more than three weeks of savage fighting. American dead, wounded and missing neared 14,000, and the Japanese garrison was virtually wiped out.

McCard's widow, Lisette, accepted his Medal of Honor from Rear Admiral Arthur S. Carpender, commander of the Ninth Naval District, at Centralia, Illinois, on 10 April 1945. The hero's citation incorrectly identifies the Japanese guns as 77mm but captures the spirit of his gallant sacrifice, reading in part, "Cut off from the other units of his platoon when his tank was put out of action … Gunnery Sergeant McCard carried on resolutely…"

Buried on Saipan, McCard's remains were exhumed in 1948 and reinterred in the Memorial Cemetery of the Pacific, Honolulu, Hawaii.

"…I COULDN'T SEE THE GUNS. THE GUNS WERE NO DOUBT IN PITS… I THINK HE WAS RIGHT IN AMONGST THREE OF THEM"

Company C Marine, eyewitness

Images: Alamy

ORIGINS OF THE GUARDIA CIVIL

WORDS **JULES STEWART**

Spain's Civil Guard was founded 175 years ago, during a century marked by conflict and instability. Since then it has played a major role in the country's biggest crises and tragic conflicts

During the early 19th century, Spain found itself in a desperate War of Independence against Napoleonic France (1808-1814). But while this should have produced a broad sentiment of national unity, the reality was the exact opposite. When the French intervened once again in the Spanish political process less than ten years later, putting an end to the 'Liberal Triennium' (1820-1823) and restoring King Fernando VII, along with his absolutist prerogatives, the divisions within the royalist camp and among the liberals deepened the divide between political loyalties.

The conservative branch of Spanish liberalism, the Moderates, took power in December 1843. They set out to resolve these problems through the establishment of strong central bodies and a strict control of the political and governing process. One of the key institutions needed to achieve these goals was a national police force. Given the nature of the political situation in Spain, this would have to be a centralised one.

This was a time of fighting between liberal and conservative factions, on the battlefield as well as in the no-man's-land of the countryside, a place infested with bandits and guerrillas. Spain was engaged in a dynastic struggle, with loyalists of Queen Isabel II pitted against supporters of Don Carlos, the rival claimant to the throne. This sparked decades of intermittent warfare, lasting until 1876.

Order out of chaos

With the armed forces stretched to the limit in those turbulent years, the government sought ways to alleviate the troops of their policing duties, which included pursuing common criminals, bandits, guerrillas and smugglers. A decree issued by the Ministry of War in December 1843 criticised in rather picturesque terms the armed forces' "occupation in pursuing thieves and all species of evil-doers … making it impossible for them to attend to their military duties". The government was split on whether to put together a corps based on the British police force, the system favoured by the liberals, or the Napoleonic model of a gendarmerie, loosely linked to the army. In the end the conservative faction won the day and the Civil Guard was founded as "a public force under the jurisdiction of the Ministry of the Interior, created to relieve the troops of these (non-military) duties and to take charge of townships, highways and remaining territory of the peninsula".

The Civil Guard came into being in March 1844, giving Spain its first elite unit directly responsible to the civilian authorities. From the outset, the plan was for the government to take charge of the new force, hence the name Civil Guard. With its distinctive olive-green uniform and patent leather forage cap, the new corps was independent of the army, to the point that any military officer joining the Civil Guard was barred from returning to active service in the armed forces.

The man approached to organise the new unit was Field Marshal Francisco Javier Girón y Ezpeleta, the Duke of Ahumada, who at the time was serving as Inspector-General of the army. Girón became the Civil Guard's first commanding officer, with the deliberately non-military rank of Director General. The appointment was the initiative of Spain's progressive Prime Minister Luis González Bravo, one of the few politicians to remain steadfastly loyal to Queen Isabel II throughout her reign. Girón was a native of Pamplona, a hotbed of insurrectionists hostile to the monarch. After being promoted to Brigadier, he took part in two of the three wars fought between pro-Isabel troops and supporters of the pretender Don Carlos.

The country that Isabel II inherited from her father Fernando VII was an impoverished land, devastated by civil conflict and a dangerous

Image: TopFoto

Cloaked guards photographed in Barcelona during the Revolution of 1934

"THE CIVIL GUARD CAME INTO BEING IN MARCH 1844, GIVING SPAIN ITS FIRST ELITE UNIT DIRECTLY RESPONSIBLE TO THE CIVILIAN AUTHORITIES"

place for Spain's overwhelmingly rural population. Putting a stop to the rampant terrorising of the countryside was the primary argument for raising the Civil Guard. 'Halt, in the name of the Civil Guard!' was a cry that soon came to strike terror into the hearts of bandits who swarmed over Spain's mountainous regions. "This was a mammoth task, requiring a permanent presence and a great deal of patience," says Spanish historian Miguel López Corral. "The Civil Guard deployed a two-pronged approach to this challenge."

By far the most effective strategy was the deployment of pairs of Civil Guardsmen in constant rotation, who would patrol the roads and lanes within the jurisdiction of their barracks. A modified version of this system remains operational today. The second tactic was for larger units to sweep areas where bandits were known to be operating.

Changing of the Guard

A decade after the Civil Guard came into being, the Duke of Ahumada's successor, General Facundo Infante, was able to declare before Parliament, "Ten years ago, marauding and the theft of carriages were seen as routine events. Today this would be regarded with shock by the public." Also, in a countryside that was largely devoid of local emergency services, the Civil Guard was charged with providing assistance in cases of floods, fires or other calamities.

By the early 1850s the Spanish government had tacitly acknowledged the Civil Guard's monopoly on maintaining law and order in rural areas. The corps' only link to the authorities was through the top government official in each province, who until the late 20th century bore the title of Civil Governor. This bestowed on the Civil Guard a greater degree of autonomy from the government, while distancing it from the army. At the same time, this raised the question of how to define its status.

In terms of jurisdiction and structure, the guard was a militarised outfit, while legally it was a dependency of the Ministry of War. There were times when this ambiguity threw the Civil Guard into conflict with the army. For instance, it was an open question of whether suppressing banditry was the exclusive remit of the Civil Guard. What if the brigands happened to be insurgents engaged in battling the established order? Was guerrilla warfare not the responsibility of the army?

The Civil Guard's institutional, jurisdictional and personal links with the military gave it a potentially dangerous degree of autonomy from civilian control, all the more so when the lines between military and civilian competencies were blurred by the presence of military officers in civilian positions.

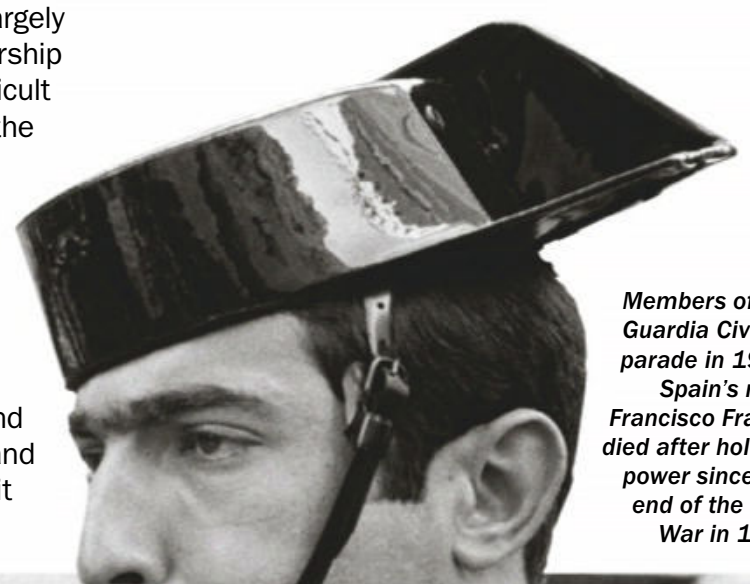
Divided loyalty

The polarisation of Spanish politics and increasing levels of social unrest and violence in the late 19th and early 20th century were key factors in influencing Civil Guard loyalties when the military rebellion began in July 1936. The pivotal role of the guard in the Spanish Civil War cannot be overstated – in 1936 the corps had 35,000 men, roughly a third the regular army's strength. Around half of the Civil Guard units defected to the rebels, in defiance of orders and often with tragic consequences. In the city of Albacete, dozens of Guardsmen who sided with the rebels were murdered and their bodies cast into the sea. In Barcelona the regional general and colonel supported the Republic and were executed after the war. In all, between 1936 and 1939 the Civil Guard lost 20 per cent of its manpower in combat.

In almost a century up to the conflict, the Civil Guard's role as the keeper of law and order in the countryside had remained largely unchanged. However, the Franco dictatorship that came to power in 1939 brought difficult times for those charged with defending the regime. Animosity toward the Civil Guard came from both sides. Franco was mistrustful of the corps, since so many had remained loyal to the Republic. In most places where they stood firm, the uprising failed. At the same time the Civil Guard became a symbol of repression among university students and workers, whose protests in the streets and workplaces were brutally put down, albeit primarily by the police.

This state of affairs worsened dramatically, starting in 1968, with the first of more than 800 assassinations by the Basque terrorist movement ETA (Euskadi ta Askatasuna, 'Basque Homeland and Liberty'). In that year ETA launched a campaign of violence whose first victim was a young Civil Guard officer in the Basque Country shot dead when he stopped two men in the street in an identity search. This was the beginning of 50 years of ETA bombings and machine-gun attacks on Civil Guard patrols and barracks, which ended in 2018 when the Basque terrorists, realising they had lost almost all public support in the Basque Country, laid down their arms and dissolved the organisation.

The Civil Guard has in more recent days expanded its role to include assistance in international peacekeeping missions in countries from Guatemala to Bosnia, as well as training missions for local police forces in Mozambique, South Africa and Palestine. The corps is also at the forefront in providing disaster relief in Spain. Not unlike the Roman Catholic Church, the Civil Guard ranks as an establishment of great symbolic importance in Spanish society. Its role as the defender of the state and the social order, along with its uncompromising military discipline, has always shaped popular perceptions of the corps. Having overcome the stigma of the Franco years, that image is today a positive one. Suffice it to point out that a recent nationwide poll rated the Civil Guard the most highly esteemed public institution in Spain.



Members of the Guardia Civil on parade in 1975. Spain's ruler Francisco Franco died after holding power since the end of the Civil War in 1939

Image: Shutterstock

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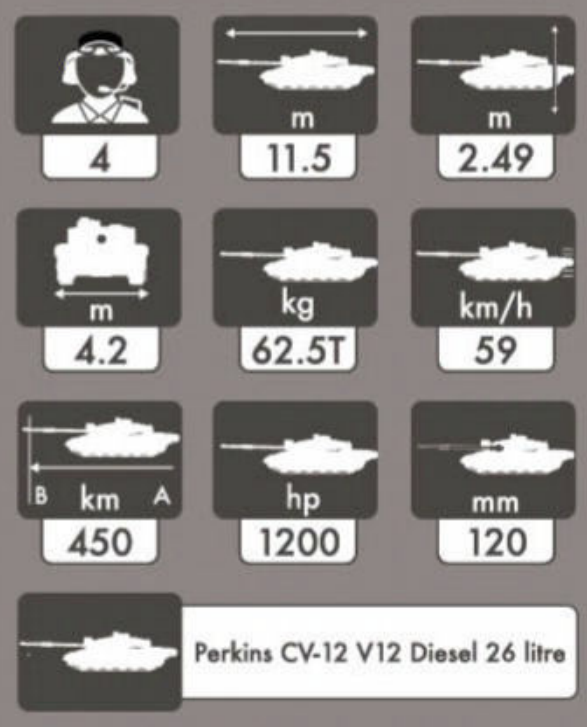

MODEL MILITARY VEHICLES
TREMENDOUS TANKS

Dominating the battlefield for 100 years, the tank was initially designed to break the stalemate of trench warfare and provide infantry units with a mobile, armoured base of fire that would give them a significant tactical advantage. Since that time, the tank has developed into an essential component of any integrated military force, whilst always challenging designers to find new ways of combining effective fire-power with greater speed and mobility – in the world of tank warfare, bigger is not always better.

First introduced by the British during the Battle of the Somme on 15 September 1916, the tank was developed under the utmost secrecy for fear of alerting the Germans to these decisive new weapons. Originally known as Landships, workers involved in their production were told that the vehicles were nothing more than mobile water tanks for use in the desert war. As military planners looked for a suitable code word for the new machines, the word tank was adopted.

As the tank developed, it would become a crucial component of German Blitzkrieg during WWII, as they perfected the use of fast moving armoured vehicles to back up infantry assaults, following devastating aerial bombardment. Today's tanks can trace their lineage back to the first British Mark I machines of the Somme Offensive and will still be found at the spearhead of any ground based military operation.

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CORSAIRS AND KAMIKAZES

AN INTERVIEW WITH KEITH QUILTER, DSC

WORDS TOM GARNER

Sub-lieutenant Keith Quilter in his Corsair, autumn 1944

Speaking as part of the FT Weekend Oxford Literary Festival, this Fleet Air Arm pilot flew against deadly Japanese attacks in 1945

The Pacific War of 1941-45 is often perceived as an extremely bloody and almost exclusive clash between the forces of the United States and Imperial Japan. Nevertheless, the Americans were extensively supported by other Allied powers including China, the Netherlands and, perhaps most visibly, Britain and her Dominions.

The latter's most significant contribution in this huge military theatre was the formation of the British Pacific Fleet. One of the largest fleets ever assembled by the Royal Navy, the BPF numbered over 200 different vessels that did not just include those from the RN but also ships from the Australian, Canadian and New Zealand navies.

Although the BPF was dwarfed by the USA's newfound naval might, it was spearheaded by the six carriers of 1st Aircraft Carrier Squadron. This alone consisted of more than 250 aircraft, which were supported by over 10,000 sailors and aircrew. Two units of the Fleet Air Arm, 1841 and 1842 Squadrons manned one of the carriers, HMS Formidable. Flying with 1842 was a young Corsair pilot called Keith Quilter.

Quilter had already attacked the German battleship Tirpitz before his squadron joined the BPF and he saw extensive action at the Battle of Okinawa and over mainland Japan. Now aged 97, Quilter reveals a dramatic, but almost forgotten war in the air where British pilots lived under the constant threat of the Japanese "divine wind" – the dreaded kamikazes.

Joining the Fleet Air Arm

Born in 1922, Quilter had an early interest in aviation and formed a 'Skybird' club for young aircraft modellers, "Skybird was the trade name for model kits that you could buy before the war. They encouraged their modellers to form clubs so some of my schoolmates used to meet up in the conservatory of my parents' house. I even acquired half of a four-blade propeller from a WWI F.E.2b, which we stood on a table. My mum also used to take me to the Hendon air display so I was interested in aeroplanes from when I was very young."

Quilter subsequently joined the De Havilland Aeronautical Technical School in Hatfield, Hertfordshire to train as an aeronautical engineer. The violence of war hit home when the school was bombed on 3 October 1940, "I had a narrow escape. A Junkers Ju 88 flew across the aerodrome and skip-bombed. The klaxon horns went off and I made a dash for it outside. As I ran, I could see this Ju 88 halfway

FAA Corsairs and Fairey Barracudas ranged on the flight deck of HMS Formidable off Norway, July 1944

Image: Hudson F A (Lt), Royal Navy official photographer

A kamikaze pilot attaches the Japanese 'Rising Sun' flag to his forehead before his flight, 1945. Quilter recalls that he and his comrades thought the suicide bombers were "mad"

across the field at about 50 feet. I more or less fell down the steps into the shelter and as I sat down the bombs exploded."

The raid killed 21 people and injured 70, most of whom were boys and young men. Quilter was exempt from military service because of his aeronautical training but the raid made him reconsider his options, "It might have motivated me to say 'To hell with being in a reserved occupation, I think I'd rather hit back somehow'."

Quilter initially tried to join the RAF but then volunteered for the Fleet Air Arm, "My parents had taken me on pre-war cruises where I developed an interest in the sea and ships. I also had an interest in aviation so the Fleet Air Arm seemed the obvious choice."

Despite his enthusiasm, Quilter was not able to fully join the FAA until the end of 1942, "There was a long waiting period from when I applied to getting selected for pilot training. All the flying schools were choc-a-bloc so you had to go back to your civilian job." Quilter was put into a 'Y' scheme where he remained in his reserved occupation and joined the Home Guard before he was called up. He served in Home Guard units in both Hatfield and Maidenhead where he served as a helmsman for water patrols on the River Thames. After being called up for pilot training at the end of 1942, Quilter was despatched to North America.

Stateside training

Quilter sailed across the Atlantic in violent storms to Canada before the British trainees encountered American servicemen for the first time in early 1943 near Detroit, "We were met by US sailors and they said 'Gee, they get younger every time!'. I'd had my 21st birthday in Canada but I was a little older than the

1842 Squadron pictured when it was formed in April 1944. Quilter is on the back row, fifth from right, but half of these men would be dead by VJ Day

average because most were only about 18." The FAA pilots trained all over the USA including Michigan, Maine, Florida and Virginia. For a young man who'd grown accustomed to the privations of wartime Britain, Quilter says that America was "wonderful". He gained his 'wings' and was commissioned as a sub-lieutenant in November 1943.

By the spring of 1944, the Royal Navy was forming a new FAA fighter squadron every month, including 1842 Squadron, which was formed at Brunswick, Maine. 1842 was the tenth FAA squadron to be equipped with Corsairs and comprised of 18 pilots, including Quilter. He would remain with this unit until the war ended, but first he had to learn how to take off and – most importantly – land on an aircraft carrier.

Deck landings

1842's commanding officer insisted on intense training, "We used to do dummy deck landings on the end of a runway and he made us do it endlessly. We did it at Bar Harbor and there was then an American saying that said, 'Remember Pearl Harbor!' We used to say, 'Remember Bar Harbor!'."

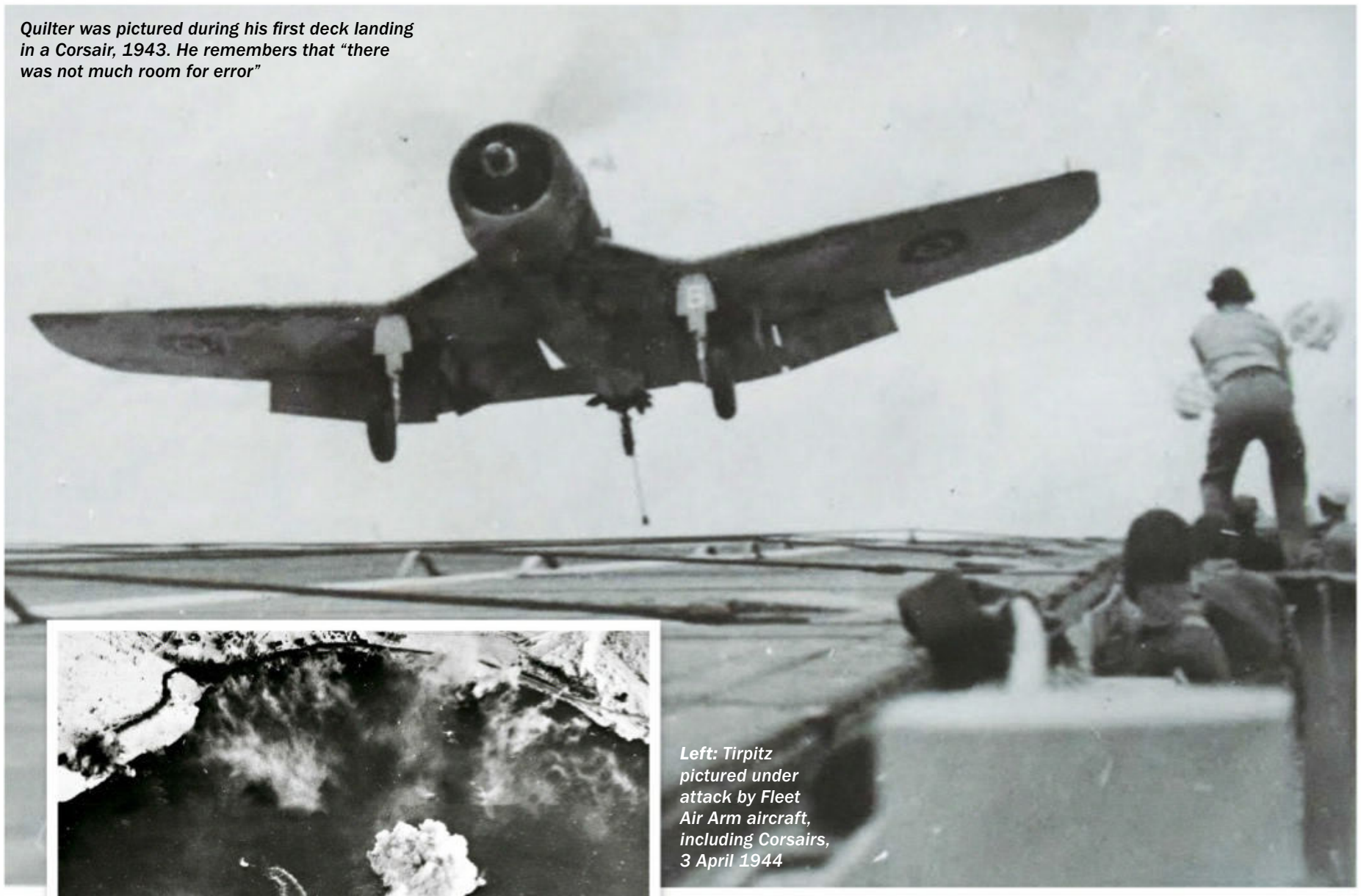
The guidance of a batsman was important for these landings, "They were always experienced pilots themselves. You'd get into the habit of following his instructions to the point where he was almost flying you! The runway was stationary but it got you in the groove of doing exactly what he told you to do."

1842 moved from Bar Harbor to Norfolk, Virginia where landings were practised on a US aircraft carrier in Chesapeake Bay. Landing on a carrier had certain advantages, "It is a floating runway and can always turn and face into wind. Furthermore, because it is not stationary the carrier can go faster if there's not much wind so that you can get the required wind speed down the runway. Having said that, the runway is fairly short so you had all these arrestor wires to stop you."

Arrestor wires were used to rapidly decelerate aircraft as they landed on deck and Quilter recalls that the system required speed and precision, "They rested about eight wires on the deck and you had a hook underneath the rear of the aircraft. There was not much room for error. You had to get the aircraft down in quick, 30-second intervals at the most."

The risks could increase after landing, "The next aircraft would come in 30 seconds behind and there was a large hole at the end of the deck where the lift went down. You didn't want the next aircraft to crash into the first one so if he missed all the wires they had barriers that were rigged up like badminton nets. If he missed the wires he would go into that but it would usually tip his aircraft on its nose. They

Quilter was pictured during his first deck landing in a Corsair, 1943. He remembers that "there was not much room for error"



***Left:** Tirpitz pictured under attack by Fleet Air Arm aircraft, including Corsairs, 3 April 1944*

Pilots of 1841 and 1842 Squadron including Quilter (fifth from right) gather on the flight deck of HMS Formidable after their attacks on Tirpitz, August 1944

could do much nastier things than that and people got killed in the barriers. Nevertheless, you needed it because a landing aircraft could crash into the other aeroplanes."

The danger of training led to the deaths of many of the trainees in accidents, including Quilter's friend Ted Portman. The pair had shared a cabin and stayed with an American family called the Parkers while on leave. Tragically, Portman was killed in a mid-air collision on 7 June 1944, "We were very close and almost like brothers. It also shook the Parkers because they'd taken to both of us and put on a memorial service in the local church. I asked their daughter Nancy to marry me, but because of what happened to Ted her father wouldn't allow it."

Bombing Tirpitz

1842 Squadron returned to Britain in July 1944 and flew aboard HMS Formidable after a period of leave. The squadron would stay with the ship until VJ Day but before they were deployed to the Pacific, 1842 first experienced combat against Germany's formidable warship – Tirpitz.

A 42,500-ton Bismarck-class battleship, Tirpitz, was the pride of the German Navy and a huge threat to Allied shipping in the North Atlantic. Despite the fact that the ship never sank a single vessel, and only once fired her main armament at sea, its psychological threat and position in the Norwegian fjords was a headache for the Allied high command.

In late August 1944, Tirpitz was anchored at Kaafjord and the Royal Navy launched Operation Goodwood in an attempt to sink it. During 22-29 August, a series of raids were launched by what was then the largest group of FAA aircraft assembled, including 1842 Squadron.

Quilter recalls his instructions, "Our job was to strafe the anti-aircraft positions near the ship. They were on the sides of the fjords and the Tirpitz herself had pretty effective anti-aircraft armament. It was a bit suicidal because if you line up an aircraft like a Corsair, you're carrying fixed guns. You couldn't move around to fire at something, you had to aim the aircraft. If you went straight at an 'Ack-Ack' position, he was firing a non-deflection shot back at you."

The main FAA bomber force against Tirpitz consisted of slow Fairey Barracudas, which enabled the Germans to pick them up on radar and form smokescreens. It was decided that 1842's Corsairs would be armed with 1,000-pound bombs and fly straight in before the smoke totally obscured the ship.

This daring operation would be carried out by the squadron's inexperienced pilots and Quilter remembers his trepidation before he flew his first action on 24 August 1944, "When you man your aircraft you've been with your mates for the briefing but by the time you get into your

Allied bombers fly above Tirpitz over a Norwegian fjord, 1944

"WHISTLING DEATH"

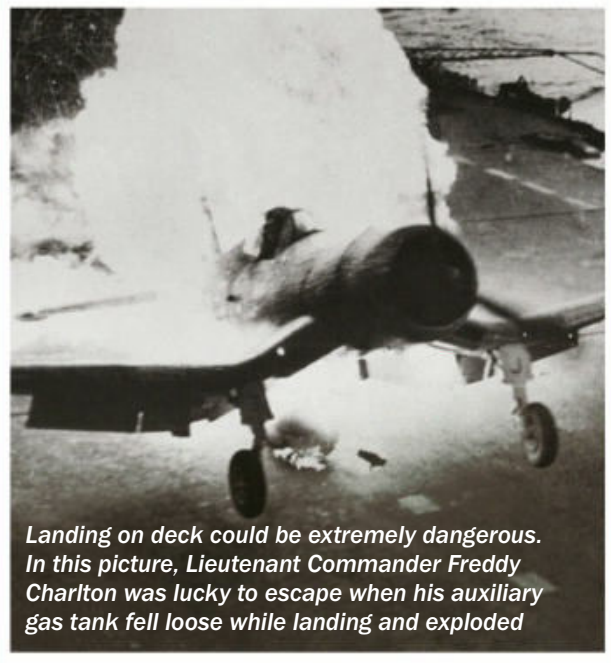
The Corsair was a distinctive, powerful fighter-bomber that was one of the most famous American aircraft of WWII

A Corsair painted in Fleet Air Arm colours. The aircraft was primarily manufactured by Chance Vought but also by Brewster and Goodyear

Designed as a carrier-based aircraft, the Corsair had a unique inverted wing and could achieve a top speed of well over 400mph. It was also armed with six machine guns, four cannons and additional payloads of rockets and bombs, which made it extremely formidable against Japanese aircraft. During its WWII service, the Corsair shot down 2,140 enemy aircraft for a loss of 189.

Nevertheless, the Corsair's operational power came at a price during its initial development and Quilter recalls his nervousness during training, "We were s**t-scared of them because they had a bad reputation. They were nicknamed the 'Ensign Eliminators' and we were apprehensive. The problem was that the Mark I had some bad traits for deck landing. It had a very bouncy undercarriage and the seat wasn't very high, which restricted the view. It had a pretty long nose and it also had a bad stall when it dropped its port wing. The designers managed to put all those things right eventually."

1842 Squadron flew improved Mark II Corsairs and the aircraft was nicknamed the "Whistling Death" for the chilling sound it made at high airspeed. Quilter recalls experiencing the noise himself during target practice, "We used to do training on a toad-splash target, which was like a little catamaran. We'd stand on the rear end of the flight deck while some of our mates flew in some way from behind the ship. You could really hear this 'Whistling Death' along with the six guns going off. Although we were at a safe distance you could understand that the Corsair must have been bloody frightening if it was coming straight at you."



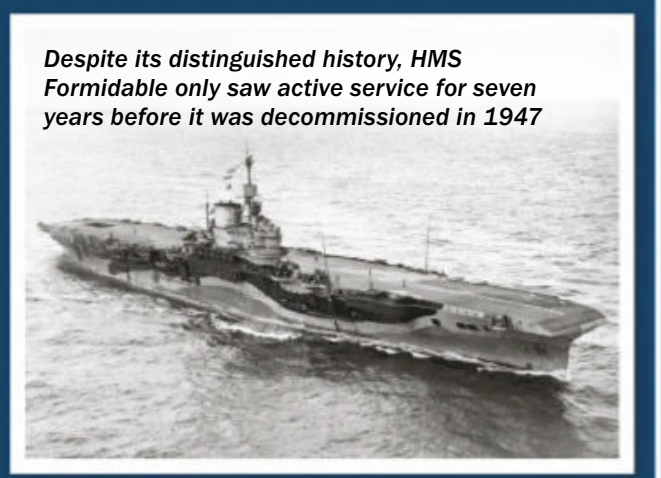
Landing on deck could be extremely dangerous. In this picture, Lieutenant Commander Freddy Charlton was lucky to escape when his auxiliary gas tank fell loose while landing and exploded

“MOST KAMIKAZE PLANES WERE ORDINARY FIGHTERS OR LIGHT BOMBERS THAT WERE LOADED WITH BOMBS AND EXTRA GASOLINE TANKS. OKINAWA WAS THE FINAL, BUT PEAK PHASE OF THE ATTACKS WHERE MORE THAN 1,400 JAPANESE KAMIKAZE AIRCRAFT WERE DESTROYED AND THEIR PILOTS KILLED”

The American 'Bunker Hill' aircraft carrier after the attack of two kamikazes (264 casualties and 372 dead in 30 seconds), on May 11, 1945

LIFE ON "FORMY"

HMS Formidable lived up to her name as a powerful ship that saw extensive service in the Atlantic Ocean and Mediterranean Sea as well as the Pacific



Despite its distinguished history, HMS Formidable only saw active service for seven years before it was decommissioned in 1947

An Illustrious-class, 23,000-ton, aircraft carrier, Formidable was commissioned in November 1940. Measuring 740 feet long with a top speed of 31 knots, the ship was protected by a thick steel flight deck and could carry 36 aircraft.

Nicknamed "Formy" by her crew, the ship played a key role in the Battle of Cape Matapan and covered the North African, Sicilian and Italian landings before she attacked Tirpitz and joined the BPF. In the Pacific, Formidable acted as the fleet's flagship but life onboard was far from prestigious.

Quilter recalls that operational conditions in high temperatures were, "Bloody awful. You had a three-inch steel flight deck and underneath you had all these steel compartments with the tropical sun playing on the deck. Forced air went through the ship but you had no air-conditioning. The air was hot of course and I couldn't stay in my cabin and used to have a camp bed on the quarterdeck."

"FORMIDABLE ACTED AS THE FLEET'S FLAGSHIP BUT LIFE ONBOARD WAS FAR FROM PRESTIGIOUS"

The heat, combined with a crew of over 2,000, made sleeping difficult but Quilter believes they were relatively lucky, "The ratings didn't have bunks and slept in hammocks. We were so overcrowded but some ships were even more crowded where pilots had to use improvised bunks in the main corridor."

Formidable seen passing through Sydney Harbour's anti-submarine boom net, 2 August 1945. The blackened funnel was caused by the kamikaze attacks

aeroplane waiting to take off you're on your own. You're sitting there wondering 'I hope I get back' but you'd be strapped in and the engines were running. Once you were flying you had plenty to do but sitting there doing nothing was the worst time."

As he flew over Norway, Quilter spotted more German ships and came under fire, "We crossed a long, narrow fjord just before we got to Kaafjord. There were German cruisers in there that were part of Tirpitz's support group and I was admiring these ships' beautiful shapes. I saw flashes and initially thought they were signalling to us and had mistaken us for Stukas. However, all these 'puffs' went off around us and I realised they were gun flashes! It was my baptism of fire but it didn't occur to me they were shooting at me."

The Germans put up a smokescreen around Tirpitz but the Corsairs could still see the ship's outline and attacked, "We duly went into our dive and I was the 'Number 2' going down. Chris Cartledge was behind me but Number Four had been shot down. Chris reckons he saw a near miss by the side of the ship although whether it was the boss's or mine I don't know. Even if it had hit the ship I don't know what damage it could have done. It was a 1,000-pound bomb but Tirpitz had got very thick armour plating."

Quilter returned to Formidable physically unscathed but when his Corsair was checked for damage he discovered that he'd had a lucky escape, "I'd had to use two hands on the joystick to get the aircraft back. I'd got a few holes in the tail but upon inspection a bullet had got into my port wing. It had gone through, nicked along the rear of the main spar and around the cable to the aileron trim. It had then travelled to the three ammunition boxes for my machine guns. It had gone through the first and second box and came to rest in the third. Had it been an incendiary bullet, it would have sent the whole aircraft up and blown the wing off. I shouldn't be here really."

Goodwood failed to sink Tirpitz but RAF Lancaster bombers sank her on 12 November 1944. Quilter believes the operation helped to decrease the battleship's threat, "It's officially recorded as a failure but we kept the Tirpitz in dock. We couldn't sink her with our aircraft because we couldn't carry heavy enough bombs. However, she was a menace to the Russian convoys so we at least stopped her coming out."

Okinawa

After returning to Scapa Flow, Formidable sailed to Gibraltar for a refit in September 1944. It did not leave for the Pacific until 14 January 1945 and finally arrived at Sydney on 10 March. During the prolonged stay in Gibraltar, Quilter became good friends with his fellow 1842 pilot Walter "Wally" Stradwick, "We were pals on leave, shared a cabin and went on missions together so you got very close."

Formidable was a late arrival to the BPF, which had been operating since January. The fleet had cut its teeth during Operation Meridian where British aircraft had attacked Japanese-held oil refineries on Sumatra. The Japanese aviation fuel output had been sharply reduced but Quilter remembers seeing negative media coverage of the BPF in Sydney, "We'd ruled the waves since Nelson but what hit us in the Australian press were the headlines that said the US Navy didn't want the British fleet out there. We were not up to their standard and we thought 'What the hell are they talking about?'. It felt insulting."

On 14 April, Formidable finally joined the BPF 300 miles southeast of the Miyako Islands. Quilter was amazed by what he saw, "I couldn't believe the size of this fleet. There were two battleships, umpteen cruisers, all these other carriers and a vast number of destroyers. It was enormous!"

Nevertheless, the BPF was the junior fleet in a much larger, American-led force, "This was the biggest fleet we'd put together but it was only the equivalent of one of their task groups and we had to operate under their command. It took a bit of getting used to."

Formidable was to provide naval support for Operation Iceberg, the codename for the Battle of Okinawa. The last major battle of WWII and one of the bloodiest, Okinawa was the largest of the Ryukyu Islands and located only 350 miles (563 km) south of Kyushu, Japan. Its capture was regarded as a vital precursor to the ground invasion of the Japanese home islands but the battle's ferocity led to the deaths of hundreds of thousands of people between 1 April-22 June 1945.

1842's main purpose was to, "neutralise Japanese aerodromes on the Sakishima Islands, which were roughly halfway between Formosa and Okinawa. I think the Japanese were training or forming up their kamikaze groups on Formosa, staging them from the Sakishima Islands up to Okinawa, or even taking off from them."

1842 performed various Combat Air Patrols (CAPs) for Iceberg, "Fleet CAPs literally went over the fleet so if we picked up enemy aircraft

Quilter's friend Walter "Wally" Stradwick kept a wartime diary, which was later extensively used in Will Iredale's bestselling book **The Kamikaze Hunters**

Image: Stradwick family

***Above:** The remains of aircraft after the kamikaze hit on HMS Formidable, 4 May 1945. Eight men were killed and 55 wounded during the this attack*

***Above:** HMS Formidable on fire after the kamikaze attack of 4 May 1945. Quilter was in his cabin when the Japanese aircraft struck*

"HAD IT BEEN AN INCENDIARY BULLET, IT WOULD HAVE SENT THE WHOLE AIRCRAFT UP AND BLOWN THE WING OFF. I SHOULDN'T BE HERE REALLY"

Smoke rises from HMS Formidable while crew members clear the damage around a gun and an FAA Corsair on deck after one of the kamikaze attacks

Quilter most feared the Yokosuka MXY-7 Ohka 'Baka', a human-guided kamikaze missile

A Japanese kamikaze explodes over USS Intrepid, 29 July 1945

we vectored off under the control of flight direction officers. Submarine CAPs involved providing air cover for surfaced subs that would pick up ditched airmen while Target CAPs meant escorting bombers into islands so they could bomb the runways. We'd be given a target as well so once they'd done their bit we'd fly over and unload our bombs onto a radio station or other parts of the aerodrome."

At the Sakishima Islands, 1842's Corsairs went on a bombing raid but they came under anti-aircraft fire, "We dive bombed on our very first strike but our CO was shot down. We lost him and it was quite a blow – we never really accepted his replacement. Also, it was during that time that the Japanese realised there was a British fleet and they started doing kamikazes on us."

Surviving the "divine wind"

Translated from Japanese as "divine wind", kamikaze attacks were deliberate suicidal air crashes into enemy targets, which were usually ships. Most kamikaze planes were ordinary fighters or light bombers that were loaded with bombs and extra gasoline tanks. Okinawa was the final, but peak phase of the attacks where more than 1,400 Japanese kamikaze aircraft were destroyed and their pilots killed.

Although kamikazes were a frightening prospect, Quilter was already aware of the fearsome tactics used by the Japanese, "Those of us who trained in the States knew quite a lot because all their commentators were reporting on the fighting on Guadalcanal etc. The Japanese hadn't started doing kamikaze attacks while we were in America but we were well aware of what the fighting was like and how a lot of it revolved around carriers."

On 4 May 1945, a Mitsubishi A6M Zero flew into the deck of Formidable, "I was in my cabin getting my flying gear on. You could hear all the guns going off so you realised there was an attack coming in. The ship then did a bit of a lurch and I thought that they had done a broadside in the old-fashioned way. But it was actually the shock of the kamikaze hitting the flight deck. Once I got on deck I realised what had happened."

The Zero killed eight men and wounded 55 but the thick armour plating prevented serious damage. Aircraft were able to land after a few hours and Formidable's crew developed extra precautions, "When the loudhailers said 'Take cover!' the people on deck hadn't heard it because all the engines were running. If a similar situation occurred again a big red flag would be waved off the side of the carrier's 'island' [the bridge and control tower]. The crew needed to take cover even if they couldn't hear the loudhailers."

This new system was put into practice only five days later on 9 May when another Zero attacked Formidable. Quilter was sitting in his cockpit on deck when the red flag was raised, "I had to get away quick so I switched the engine off, undid my straps and climbed out. I certainly didn't think 'I'll stop and have a look'. I'd got about three decks down before it actually hit."

After this second kamikaze attack, a petty officer was killed and four were wounded. There had also been an explosion and fire that destroyed 18 of the ship's aircraft.

Quilter's Corsair was also "quite badly damaged at the rear end. I could well have been hit by shrapnel if I'd not got below." These suicide attacks were not only deadly and frightening but also frustrating, "The thought that the kamikazes were around and were prepared to do this sort of thing was quite unnerving. Having trained as fighter pilots, we all wanted to intercept one and shoot it down. I once got vectored off to go after some bogies but we never caught them."

For Quilter and his comrades, the thinking behind the kamikazes was, "just incomprehensible to us. How they could get into a mindset where you weren't fighting an enemy by bombing or strafing a ship – you were actually flying your aeroplane straight into it. We thought they were mad."

The most terrifying prospect was being attacked by a rocket-powered kamikaze missile known as a 'Baka', "It was a flying bomb with a pilo in it and was the thing we feared most. If one hit the ship it would really finish i off because it had 2,000 pounds worth of explosives in its nose."

Attacking Japan

Formidable was forced to return to Sydney for repairs but the BPF's participation at Okinawa meant that "we'd proved ourselves to the Yanks".

Keith Quilter was awarded the Distinguished Service Cross for his daylight flying operations against Japan

USS Scabbardfish rescued Quilter near the Japanese coast, a submarine that received five American battle stars for its WWII service

Nevertheless, Quilter acknowledges that the Pacific was better suited to the Americans, "The US Navy had organised their fleet to cope with this vast ocean. Britannia had ruled the waves but that was in the Atlantic, Mediterranean, Indian Ocean etc and we'd had bases everywhere. We were not used to supporting the US fleet in the Pacific. They knew that and didn't want us holding them up. However we managed to scrape together a fleet and it worked reasonably well."

Once Formidable rejoined the BPF, military operations had turned to attacking Japan itself. On 18 July 1945, Quilter's first strike was against an aerodrome on the opposite side of Tokyo Bay from the capital. Flying with Stradwick and other Corsairs of 1842, he was given specific instructions by his commanding officer, "He said he'd attack from 8,000 feet and dive-bomb but if we went in at ground level we could follow him. We got to within five minutes of the target and he went over some stratus cloud. We lost sight of him."

Quilter was flying into a dangerous situation, "We came to the aerodrome at only 50 feet up whereas I was used to dive-bombing from a height. We were also at a reasonably high speed but nothing like what you'd do if you were in a diving attack. Here, we were sitting ducks."

His flight of four Corsairs proceeded to attack but tragedy soon followed, "Poor old Wally got hit and crashed alongside me. My wingman also called up and said his engine was overheating and the oil pressure was dropping so I sent him back to the fleet with Wally's wingman to escort him. This left me on my own and I joined the tail end of the CO's flight as a fifth aircraft."

Stradwick was only 22 years old and the first British forces airman to be shot down and killed over mainland Japan.

Quilter would almost lose his own life in similar circumstances only ten days later.

Ditching

On 28 July 1945, Quilter was dive-bombing targets near Osaka when his flight saw a Japanese destroyer in the harbour of Owase, "The boss detailed me to take my flight down and have a go at it. Owase has high hills around it and the ship was on the inside of the breakwater so we couldn't attack from the sea. We came down low, skimmed over the top of the houses, strafed and skip-bombed it." Shortly afterwards, Quilter received some alarming news, "I wasn't aware of anti-aircraft fire when somebody said that my Number 3, Ian Stirling, had ditched. He'd taken Wally's place and I didn't want to lose another Number 3. I noticed a side creek and thought that if we came up the creek at sea-level I might be able to see him." While searching for Stirling, Quilter had an emergency of his own, "I got halfway up the creek when my engine stopped. I don't know whether I'd been hit or my engine failed but I also ended up in the sea."

Quilter ditched his aircraft, "The Corsair planed quite nicely on those inverted wings until it stopped. However, with its long nose and engine it very quickly tips up so I had to get out pretty quick. I had a folded dinghy between my backside and the parachute so I pulled it out, pressed the button which inflated it and climbed in."

Now exposed in the water and very close to the Japanese coast, Quilter hurriedly attempted to escape, "I thought I'd had it because I assumed they would put a boat out and capture me. I was paddling like mad to get out to the open sea."

After an hour in the water, Quilter thought he was in even more danger when a submarine surfaced, "I thought it was Japanese and when it came towards me I thought 'They're going to finish me off'. I knew only too well what the consequences of being caught would be. I thought a Yankee submarine wouldn't come in this close but it was American."

Quilter was rescued by USS Scabbardfish, a Balao-class submarine that was tasked with rescuing downed Allied airmen, "When we first heard about the submarine rescues I thought 'Bugger that. I'd rather stay in a dinghy than go in a bloody submarine'. But when you're in a dinghy and a submarine comes alongside it looks enormous and very inviting! When they picked me they said 'It's a God damn Limey!' and I said 'My mate's a bit further up the creek' so they picked Ian up as well."

After being rescued, Quilter and Stirling remained aboard Scabbardfish for the remaining weeks of the war, including when the atomic bombs were dropped on Hiroshima and Nagasaki. When Japan surrendered on 15 August 1945, Scabbardfish was arriving into Saipan, "American ships are dry but some alcohol appeared in this submarine so we had a few drinks onboard. We then went ashore and everyone was celebrating. I've said many times since that I don't remember the rest of that day!"

After VJ Day, Quilter was able to travel back to the BPF via Guam before rejoining Formidable at the Admiralty Islands. With hostilities now ended, the ship sailed back to Australia, "There were 2,000 of us crammed into this ship and however well you got on with your mates there were times when you just wanted to be alone. I was off-duty and the only place I could be alone was on the quarterdeck where I could watch the wake disappear."

Quilter reflected on what had happened to him, "We'd lost Wally and I'd been shot down and rescued by a submarine but the war was over. It suddenly hit 'I know exactly where I'm going and I know I'm going to get there'. I'd previously been looking at that wake and thought 'I wonder where we're going this time? I wonder what I'm letting myself in for? I wonder if I'll get back and see my home again?'. I'd suppressed these thoughts but if you didn't suppress them you just went down."

The "forgotten fleet"

Although it was only operational for a short time, 1842 Squadron's losses had been horrendous, "When we originally formed we were 18 pilots. Of those 18, there were only two left flying by VJ Day, 13 had been killed, either in action or accidents, and a further three, including myself, were out of action. The squadron was still 18 because you'd get replacements but some of them were killed too."

Despite the size, contribution and sacrifices made by the BPF, Quilter regrets that its role has been neglected, "It was the forgotten fleet. The army guys in Burma say that they were the 'Forgotten Army' but nobody has heard of the BPF. Let's face it, it did come at the end of the war and the Yanks had fought their way across the Pacific. It was their theatre and sometimes I think 'Why did we go?' if they could have done it on their own. We had all these blokes killed and nobody recognises that we were there. It's a bit hurtful but at the time we felt we needed to be there."

In 2012, Quilter revisited Japan with his friend and author Will Iredale for the first time since the war for an "incredible" experience. He was able to pay to his respects to Wally Stradwick who is buried in Yokohama War Cemetery and had a poignantly ironic moment when he entered the country, "A Japanese customs guy said 'Have you been here before, and if so what was your business?' I said to Will 'I think I'll say I've never been here before…'."

Image: Alamy, Getty, Keith Quilter, Shutterstock

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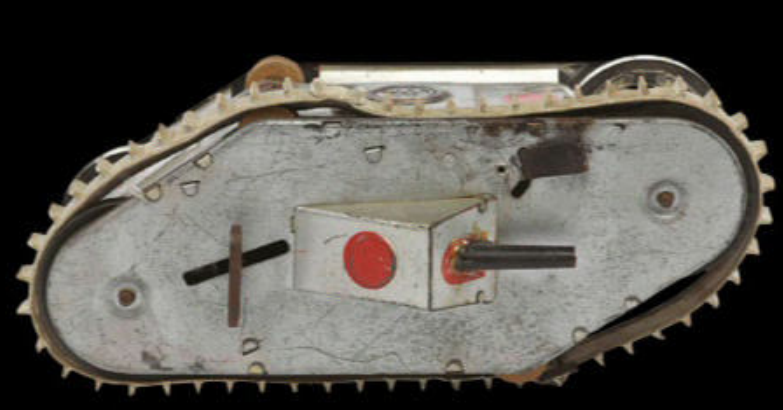
88 PERSUASIVE PROPAGANDA
INSIDE THE LATEST EXHIBITION ON WWII ARTIST ABRAM GAMES

HISTORY of WAR

HOMEFRONT

84
NEW FILM'S PROJECT TO RE-CREATE A LANCASTER COCKPIT

90
THE LATEST MILITARY HISTORY TITLES TO HIT THE SHELVES



98
1931 CLOCKWORK TOY 'TURNOVER TANK'

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Scale models were used for the majority of the film's visual effects

RE-CREATING A LANCASTER COCKPIT

WORDS **ANDY SAUNDERS**

When film company Tin Hat Productions set to work on new WWII film *Lancaster Skies,* it was quickly recognised that a serious impediment to filming was the unavailability of any Lancaster cockpit or rear turret for the action shots. However, an innovative solution was soon discovered

Described as an homage to the war films of the 1940s and 50s, *Lancaster Skies,* directed by Callum Burn*,* tells the fictional story of a Lancaster bomber crew in the lead-up to a crucial raid on Berlin in 1944. With the story commencing in 1943, the film finds Flight Lieutenant Douglas Miller angry and bereaved by the death of his younger brother. As a former Spitfire pilot, Miller finds himself transferred to Bomber Command and on his new posting discovers he is replacing the highly respected skipper of a Lancaster crew who had just recently been killed in action while saving the lives of his comrades.

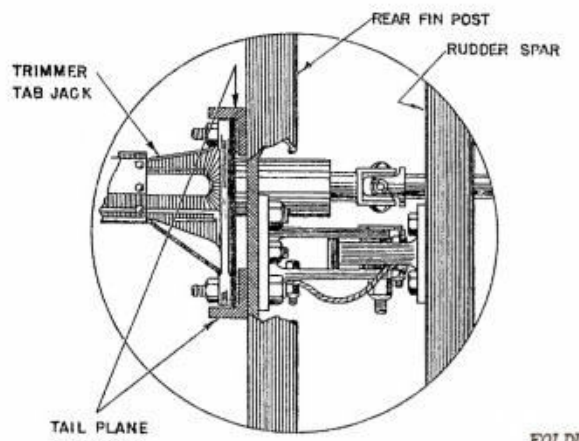
It is an appointment which does not auger well, with Miller finding it difficult to bond with the crew and to fill the shoes of their recently deceased and much-loved skipper. However, he needs to become the leader they desperately need before they set out on the Berlin raid.

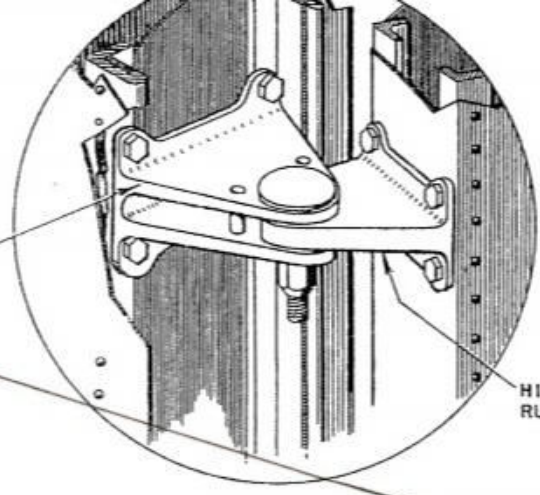
Much of the action takes place inside the aircraft, and while the preserved Lancaster, NX611, Just Jane, was made available for all exterior and ground-running scenes at the Lincolnshire Aviation Heritage Centre, East Kirby, it was simply impossible to use the aircraft for interior filming.

This was due to space constraints and other important considerations, such as the risk of potential damage to the cockpit of Just Jane. Additionally, the need for difficult camera angles would have been impossible to achieve within an original cockpit without removing parts of the aircraft itself.

With a limited budget, and no access to the sophisticated ‘money-no-object’ film set workshops of mainstream film companies – or even any availability to green screen or CGI technology – Tin Hat Productions came up with a unique solution: a DIY home-built wooden replica.

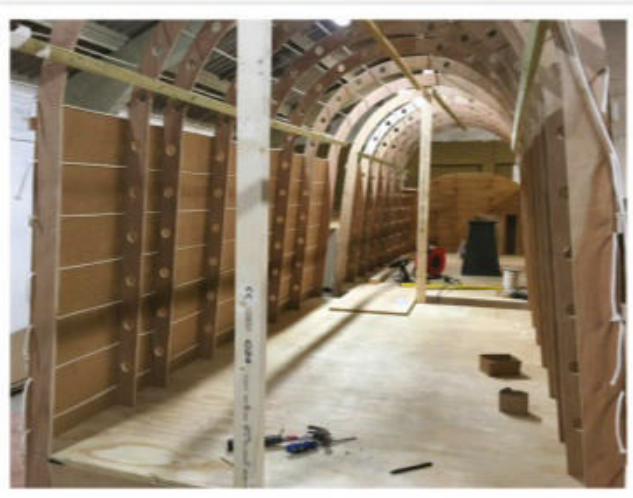
***Below:** Scenes from the new film* **Lancaster Skies**

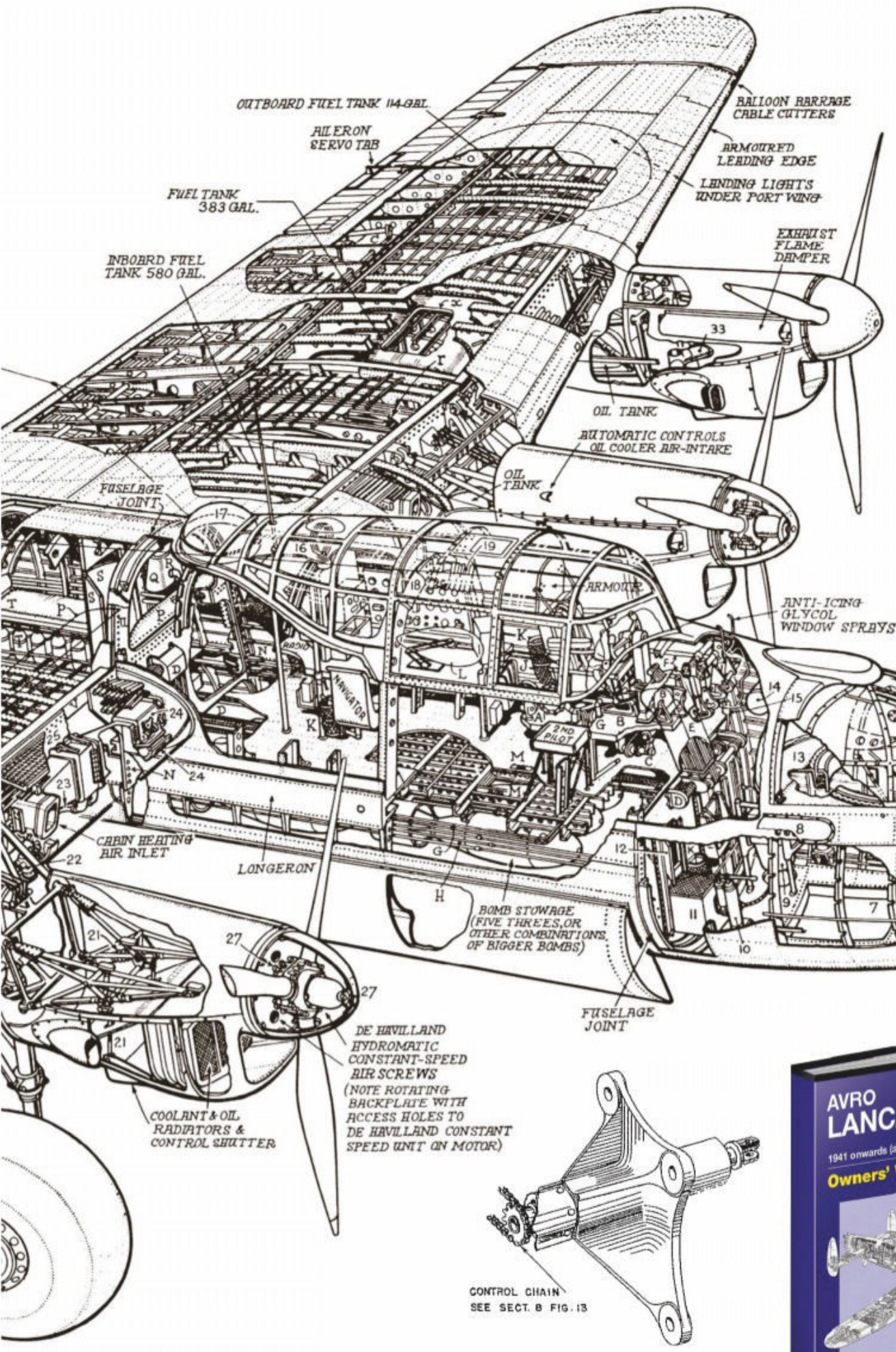




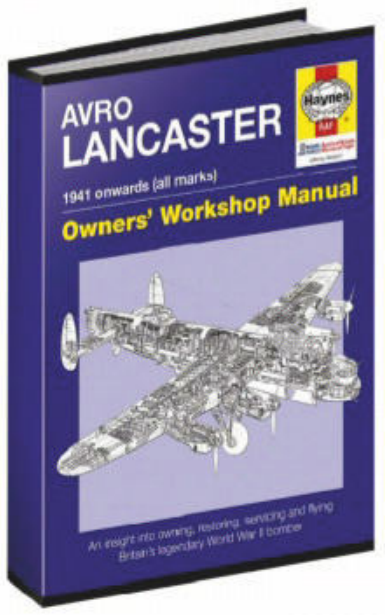
“THE HAYNES BRAND RESONATES WITH ME. I’M FROM A GENERATION WHERE YOU’D STICK YOUR HEAD UNDER THE BONNET USING A HAYNES MANUAL FOR GUIDANCE, BEFORE TAKING YOUR CAR TO THE GARAGE”

The interior of the Lancaster bomber in the movie was built by writer and producer Andrew Burn, here are some work-in-progress shots





One of the technical line drawings found in the Haynes Avro Lancaster Owners' Workshop Manual, right, which was used to create the replica Lancaster bomber interior



***Right from top:** Scenes from* Lancaster Skies *and a closer look at the completed bomber interior*

As experienced set builders, the father and son team from Tin Hat Productions used technical drawings featured in the acclaimed Haynes *Avro Lancaster Owners' Workshop Manual* to build a full-size replica of the aircraft's interior, large enough to house the actors in their bulky flying kit along with a camera crew and equipment. The Sleaford-based production company spent three months building the ambitious replica – a 45ft section of the aircraft's fuselage interior, which includes the cockpit, the flight-engineer's and navigator's positions, as well as the rear gun turret.

Andrew Burn, producer and writer with Tin Hat Productions, commented, "The Haynes brand resonates with me. I'm from a generation where you'd stick your head under the bonnet using a Haynes manual for guidance, before taking your car to the garage. Making a film with an £80,000 budget is no easy feat. We knew we'd have to call in a few favours and do a bit of DIY on the set. The Haynes manuals were a fantastic reference for us to ensure we'd got things as accurate as possible."

Using the Haynes manual as the sole reference source, Andrew was able to calculate the amount of material needed to complete the build and a local builder's merchant generously sponsored the construction project.

Jonathan Falconer, senior commissioning editor for Aviation, Military & Maritime titles at Haynes Publishing added, "We love hearing stories from the public who have used Haynes manuals to fix their own cars or bikes, but this is certainly the first we've heard of it being used to build a replica aircraft interior for a film set! We're thrilled the manual has helped tell such an inspiring story. Haynes is renowned for its iconic technical line drawings, which feature within almost all our workshop manuals, and we pride ourselves on the accuracy of these. It's great to see them used in such an unusual and creative way."

The end result was certainly a creditable effort, with the replica working exceptionally well within the context of the film. Although devoid of the finer and more intricate detailing of a Lancaster's interior, details which would not have been seen in the shots anyway, the reconstructed cockpit and fuselage suited its purpose admirably. Having served its time on the film set, it is now exhibited at the We'll Meet Again Museum in Frieston Shore, Lincolnshire, where it is likely to be a popular attraction.

The film itself, *Lancaster Skies,* was screened in selected cinemas across the UK during March and will also be available on DVD from 20 May 2019.

Images: Haynes, Tin Hat Productions

MUSEUMS & EVENTS

Discover powerful posters from WWII, the IWM's exhibition on the current Yemini Crisis and a campaign to support a new Royal Marines Museum

PERSUASIVE PROPAGANDA

The wartime work of a talented graphic artist is being displayed in an exhibition of over 100 posters at the National Army Museum

Abram Games (1914-96) was a pioneering graphic artist who was employed to create posters for the Public Relations Department at the British War Office from 1941-45. Games was a staunch socialist of Jewish refugee heritage who joined the British Army in 1940. This was at a time of social unrest when National Service was becoming an unthinkable necessity, particularly when memories were still fresh of the conscription of WWI.

Games saw an opportunity to communicate ideas that could help win the war and also bring about social change in Britain. He did this by creating posters that recruited, educated, informed and influenced both soldiers and civilians alike. Working to a mantra of, "Maximum meaning, minimum means," Games was a master of reductive design and continues to influence industry professionals today.

"WORKING TO A MANTRA OF, "MAXIMUM MEANING, MINIMUM MEANS", GAMES WAS A MASTER OF REDUCTIVE DESIGN AND CONTINUES TO INFLUENCE INDUSTRY PROFESSIONALS TODAY"

Now presenting over 100 of his striking posters, the National Army Museum is hosting 'The Art of Persuasion: Wartime Posters by Abram Games' from 6 April to 24 November 2019. The exhibition will explore Games's masterful use of the airbrush, a limited colour palette, bold typography and stark imagery to cover difficult subjects like saving lives and censorship. His work marked an important progression in British graphic design to the extent that he is also being commemorated by an English Heritage blue plaque in conjunction with the exhibition opening.

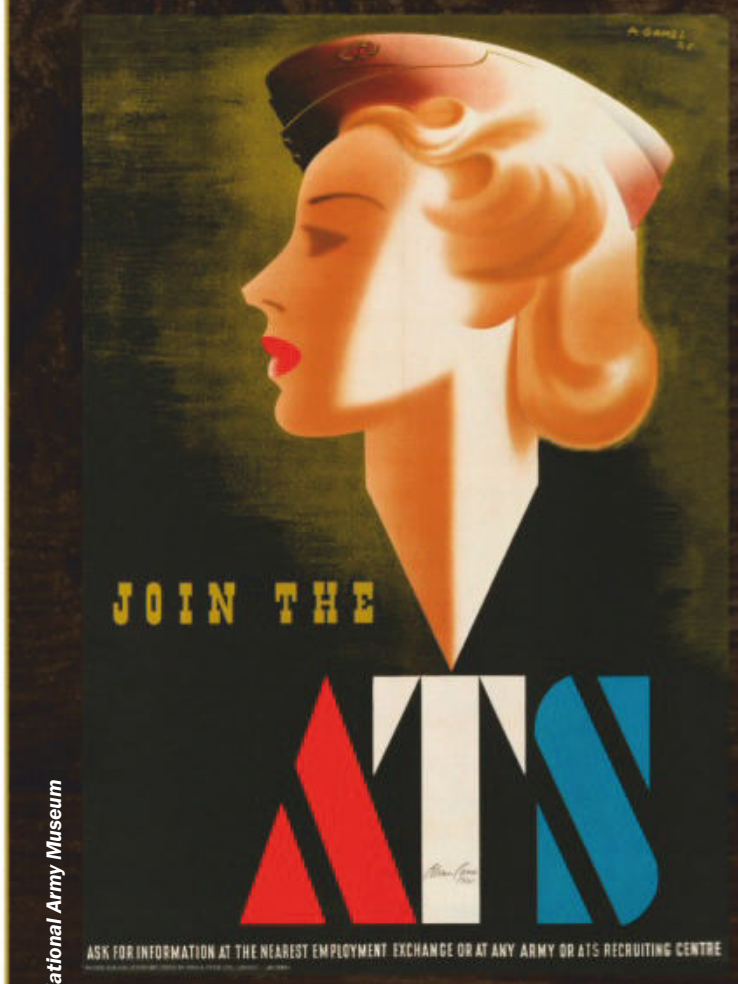
As well as his posters, visitors can view Games's painting smock, palette, airbrush and school report as well as incorporated audio interviews with experts who discuss his legacy. They can also test their own artistic prowess through a digital interactive, which harnesses Games's distinct style.

Justin Maciejewski, the director of the National Army Museum states, "The work of Abram Games as a graphic designer and British soldier in support of the causes of freedom and social justice during the Second World War is remarkable and inspiring, and we are proud to be showing the full body of his work as the Army's poster designer."

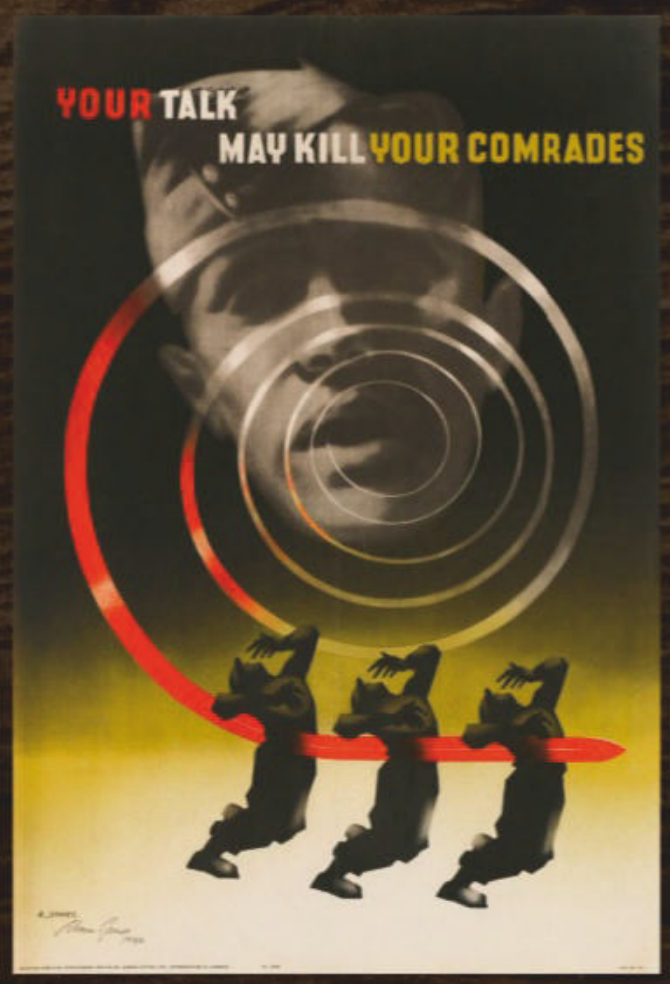
Meanwhile, Games's daughter Naomi has said on behalf of the family estate, "We are delighted that our father's work will be exhibited at the National Army Museum. He was a proud Londoner and a member of the British Army. It is fitting that the work of the only ever War Poster Artist is exhibited at the museum."

While general admittance to the NAM is free, booking is recommended for the exhibition.

TICKET PRICES & MORE INFORMATION: WWW.NAM.AC.UK



Join the ATS became known as the "Blonde Bombshell" poster. The design's aim was to challenge the previously drab image of the Auxiliary Territorial Service

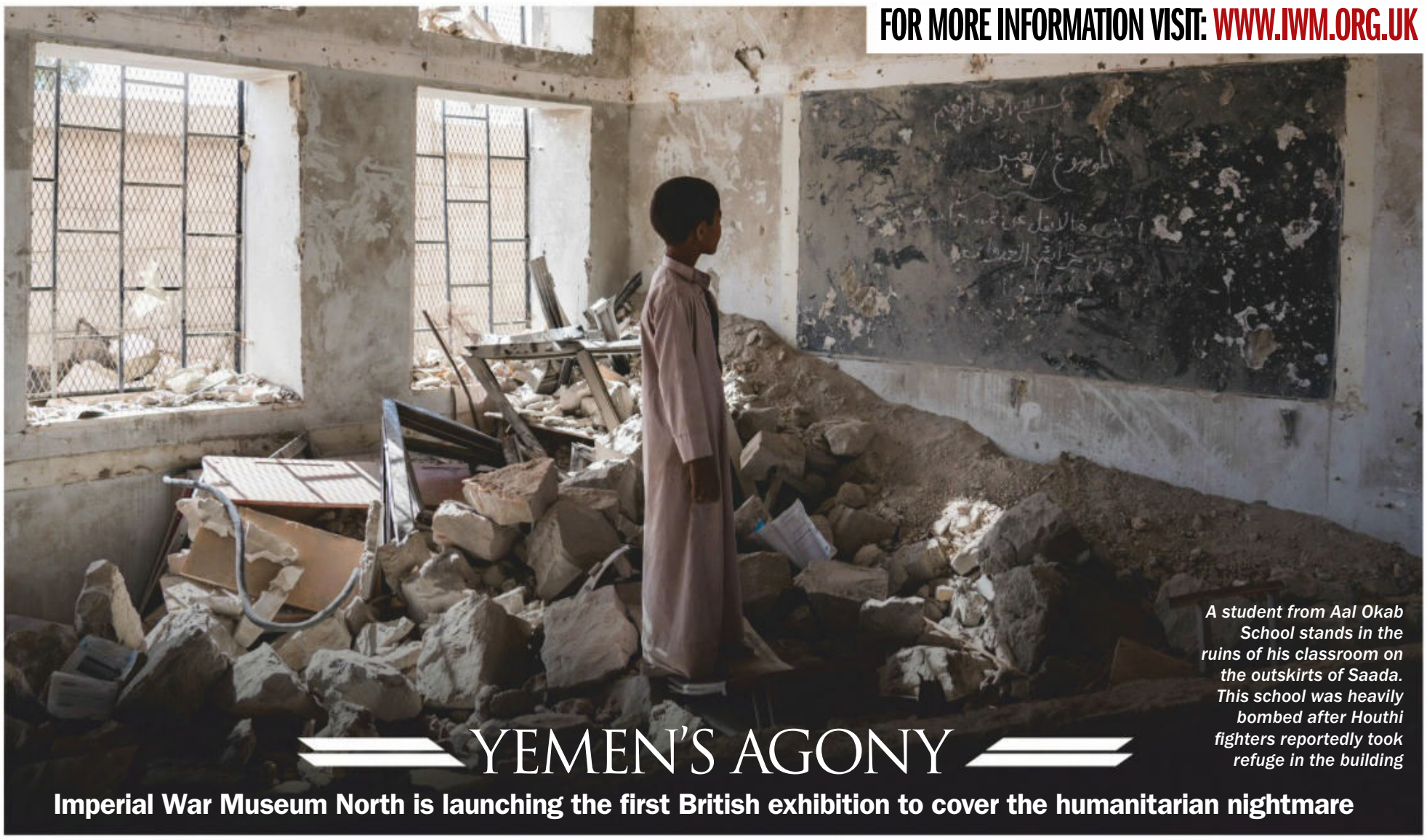


Your Talk May Kill Your Comrades depicts a spiral symbolising careless gossip. The swirl originates from a soldier's mouth and ultimately bayonets three fellow servicemen

Games was initially hired by the War Office to design a poster for the Royal Armoured Corps

Images: National Army Museum

Images: Imperial War Museum



FOR MORE INFORMATION VISIT: WWW.IWM.ORG.UK

A student from Aal Okab School stands in the ruins of his classroom on the outskirts of Saada. This school was heavily bombed after Houthi fighters reportedly took refuge in the building

YEMEN'S AGONY

Imperial War Museum North is launching the first British exhibition to cover the humanitarian nightmare

'Yemen: Inside a Crisis' is the UK's first major exhibition to address the country's ongoing but underreported crisis. Described by the UN as the "world's worst" humanitarian crisis, the conflict within Yemen has so far left an estimated 80 per cent of its citizens in desperate need of assistance. The current war began in the aftermath of the Arab Spring and has since tipped the nation into an economic tailspin. Food, water and healthcare are now beyond affordability for most Yeminis with concerning physical and psychological effects being most noticeable in children.

IWM North's new exhibition explores the causes of the conflict in Yemen and its relationship with Britain to the present day. 'Inside a Crisis' contains 50 exclusively sourced objects and photographs that will be displayed as well as new work from spoken-word artist Amerah Saleh. Key exhibits include medical equipment used to treat malnutrition and cholera, charity food vouchers and harrowing images captured by Yemeni photographers.

The exhibition will not just be confined to IWM North's home at Salford Quays but also taken into Manchester. The travelling display will feature a digital artwork created by FutureEverything that gives an insight into the day-to-day scenarios faced by Yemini people.

Admission is free for 'Inside a Crisis', which will run from 17 May-24 November 2019.

ADOPT A MILITARY ARTEFACT

A JustGiving campaign enables people to sponsor unique objects from the Royal Marines Museum collection for a new venue in Portsmouth

Supporters of a campaign to open a new Royal Marines Museum in Portsmouth Historic Dockyard have been given an opportunity to adopt an object from their collection. The collections depict the history of the Marines from 1664 to the present day and the new museum will firmly place their story alongside the Royal Navy.

'Adopt an Object' on JustGiving includes artefacts such as a Crimean War telescope, WWI trench mirror and a Lewis machine gun. The latter is said to have been used by Sergeant Norman Finch during the Zebrugge Raid in 1918. Finch won a Victoria Cross for his bravery aboard HMS Vindictive, which was awarded by ballot. Twenty special artefacts have been selected and the scheme gives the chance to put your name to some of the most interesting, informative and educational items in the collection.

There is no minimum donation but donors can become a senior adopter of an object for £500. They will then be invited to a special event ahead of the opening of the new museum. Recognition will also be made of all donations over £120 within the new museum when it opens.

TO ADOPT AN OBJECT VISIT: WWW.NMRN.ORG.UK

This Lewis machine gun was used on the Zebrugge Raid, a Royal Navy operation to block the Belgian port in an attempt to prevent German vessels from leaving

Image: National Museum of Royal the Navy

HISTORY of WAR REVIEWS

Our pick of the latest military history films and books

303 SQUADRON

DOES THIS RETELLING OF THE ICONIC POLISH RAF SQUADRON'S STORY OFFER ANYTHING NEW FOR AUDIENCES?

Director: Denis Delic
UK Digital & DVD Release: 29 April

Sometimes, by sheer coincidence or creative differences, two films on the same subject emerge nearly simultaneously. This is the case of *303 Squadron*, directed by Denis Delic, scheduled for its UK release not long after David Blair's *Hurricane*. Both films set out tell the story of Polish pilots fighting against the Luftwaffe in the Battle of Britain during the summer of 1940 – and both follow similar script structures. However, *303 Squadron* makes a more accurate adaptation of the classic book by Arkady Fiedler, and the true lives of the legendary pilots, among them Jan Zumbach and Witold Urbanowicz, portrayed in the film by some of Polands' most popular actors.

It would have been to both films' advantage to have more divergent story structures, as in the case of *Anthropoid* and *The Man with the Iron Heart*, as a very good example of telling the same story brilliantly in different ways. As often with historical dramas, *303 Squadron* has a difficult balance to tread between exposition dialogue and the filmmaking mantra of "show - don't tell", which along the film's love story subplots and character backstories feel somewhat staged and don't carry enough weight. However, the film is not without its own merits, and with some very moving moments it succeeds in its well-executed dogfight scenes. These gripping scenes offer us a glimpse into the otherworldly existence that was experienced by the brave Polish fighter pilots, who defended British skies against German invasion. **MB**

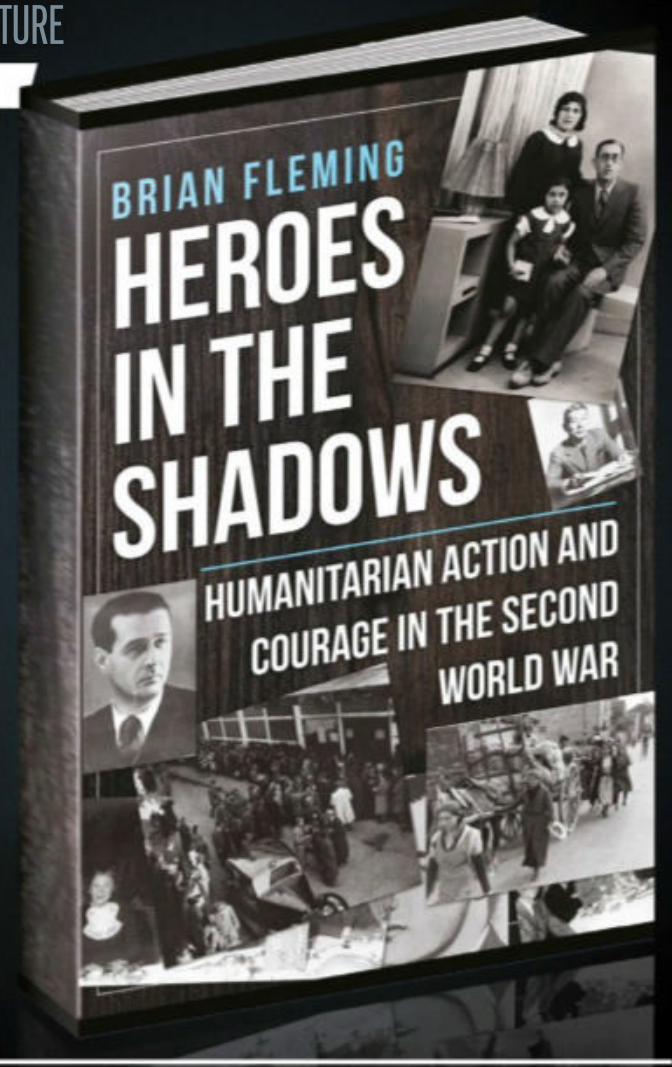
There are plenty of moving moments amid the action in 303 Squadron

HEROES IN THE SHADOWS

HUMANITARIAN ACTION AND COURAGE IN THE SECOND WORLD WAR

A COLLECTION OF FASCINATING STORIES, BUT ONE THAT COULD BENEFIT FROM A MORE OBVIOUS STRUCTURE

Author: Brian Fleming **Publisher:** Amberley **Price:** £20.00



In his latest book Dr Brian Fleming returns to a subject in which he is well versed, investigating some of the extraordinary actions undertaken by individuals and organisations, while helping refugees escape persecution during the Second World War.

The subject matter is riveting and the tales of courage deserve to be told, so Fleming has provided a great service in researching the stories and presenting them in a single volume. Doubtless countless others could have been included and a big part of the author's job must have been deciding what to leave out.

Stories such as that of Père Marie-Benoît, an ordained minister in a Capuchin monastery, and the Japanese diplomat Chiune Sugihara are fascinating and make for informative reading, but the book badly needs more of a framework to do its stories justice.

The introduction is a missed opportunity. It could have laid out exactly what the book was intending to do and how it would proceed, but it fails to shed light on how the book is structured, and it is not instantly obvious how each chapter is differentiated from the previous one. Similarly, the book ends abruptly at the end of the last story. There is no effort to tie things together in a conclusion.

The result is that the book becomes little more than a collection of individual tales. There is the obvious unifying theme, but that is not enough to guide the reader through the pages of what is otherwise a well written and engaging text. **DS**

"THE SUBJECT MATTER IS RIVETING AND THE TALES OF COURAGE DESERVE TO BE TOLD, SO FLEMING HAS PROVIDED A GREAT SERVICE IN RESEARCHING THE STORIES AND PRESENTING THEM"

VIETNAM'S FINAL AIR CAMPAIGN

OPERATION LINEBACKER I & II MAY-DECEMBER 1972

THESE BOMBING MISSIONS WERE LAUNCHED IN THE ENDGAME YEARS OF THE VIETNAM WAR

Author: Stephen Emerson **Publisher:** Pen & Sword Military **Price:** £14.99

In 1972, President Nixon was committed to drawing down US troops in Vietnam, but peace still seemed illusive. To force the North Vietnamese into reaching a serious agreement, he ordered the US Air Force and US Navy to unleash an uninhibited air campaign against the north. For the first time since Operation Rolling Thunder (1965-68) US warplanes returned to the North in earnest, and this time there was to be no political interference in the process. For a year the US commanders were free to conduct a purely military campaign, using the latest aircraft, techniques, and technology, including laser-guided bombs and anti-SAM measures. The campaign was a success, forcing the North into meaningful talks and an acceptable, if temporary, peace.

Part of Pen and Sword's Cold War series, this book provides a concise overview of the political and military aspects of the campaign. It begins by laying the background and the circumstances for the change in US policy, before examining how the campaign was planned and developed. The author weaves together the American capabilities and tactics with those of the opposing North Vietnamese air defences, and the on-going political manoeuvring between the combatant nations to provide a rounded account of the Linebacker operations. The on-going campaigns over Southern Vietnam feature to a lesser extent. It is well illustrated with black and white and colour photographs, as well as some excellent maps and plans of raids and formations. **SH**

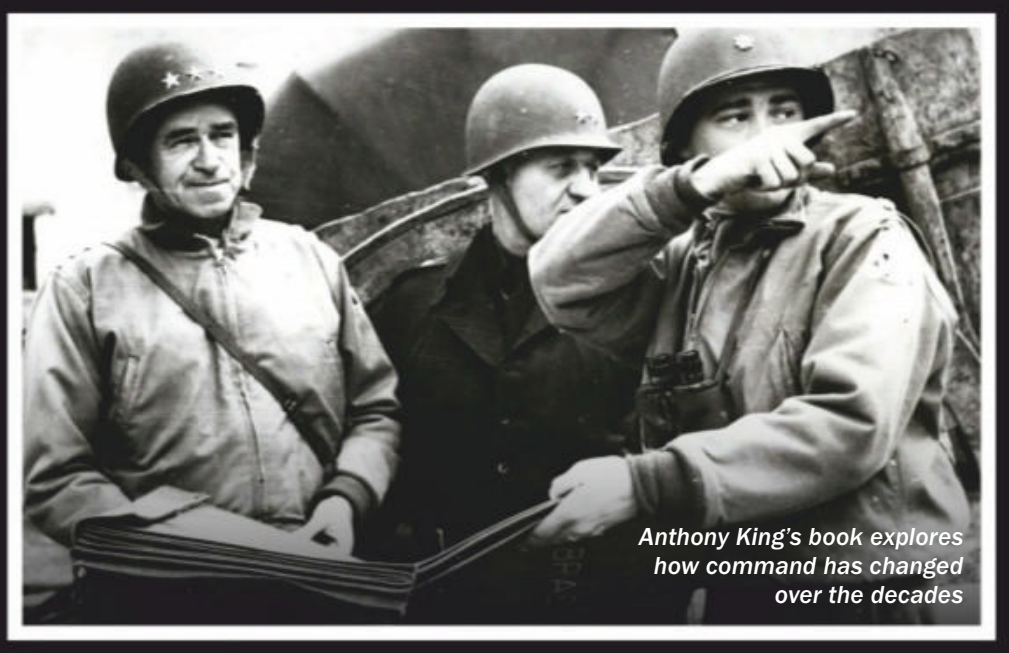
COMMAND

THIS NEW STUDY INVESTIGATES HOW THE CHAIN OF COMMAND IN MODERN MILITARIES HAS ADAPTED TO THE DEMANDS OF MODERN WARFARE

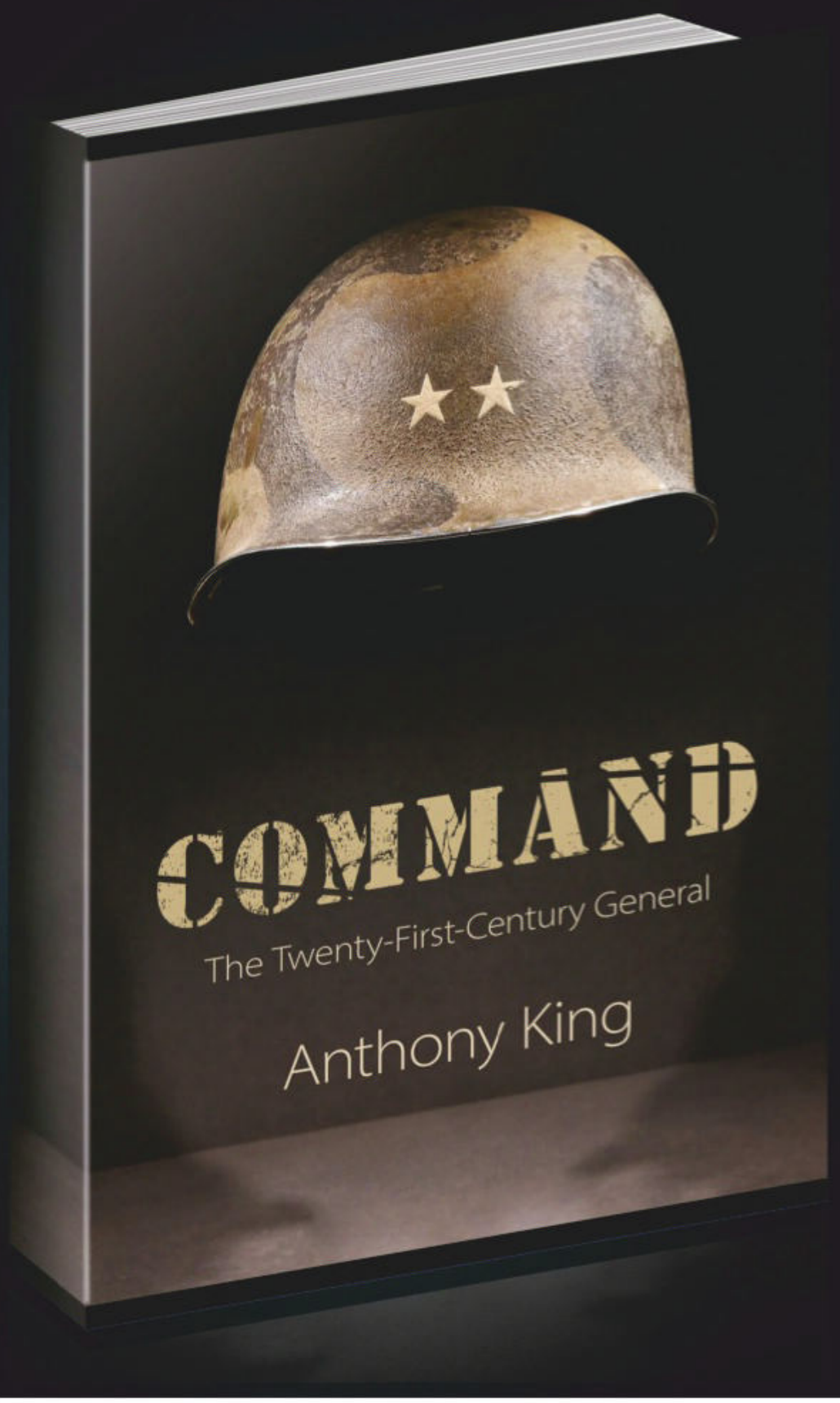
Author: Anthony King **Publisher:** Cambridge University Press **Price:** £19.99

In the wake of troubled campaigns in Afghanistan and Iraq, it can and has been argued that decision-making in Western armed forces is facing a crisis. This is reflected in the fact that military leaders have been subjected to intense and sustained public criticism, in political as well as media circles. Taking these interventions as a starting point, noted military historian Anthony King examines the transformation of command in the 21st century.

The author focuses on the army division, highlighting the development of a phenomenon of collective command. In the 20th century, generals typically directed and led operations personally, and in doing so they exercised a monopoly in decision-making. Their style of command was individualist, sometimes rising to personal heroism. With the expansion in range and scope of operations, decision-making has likewise multiplied and diversified. King argues that as a result of this process, command is becoming increasingly professionalised and collaborative.



Anthony King's book explores how command has changed over the decades



Through interviews with many leading generals and a vivid ethnographic analysis of divisional headquarters, the narrative provides a unique insight into the transformation of command in Western armies. King explains that in the spring of 2013, it became clear that the British Army was reorganising itself quite radically, following the Iraq and Afghanistan interventions. "It was reinvesting in the division, a latterly neglected formation," he says. National sovereignty is no longer as absolute as in the past. The process of globalisation has brought about a radical reconfiguration of army structure. In response to this change in organisational structure and the operations in which the division has emerged, a new and highly professionalised practice of command has appeared, one which the author calls "collective command".

"Commanders have shared decision-making authority," he says, "integrating subordinates, staff and partners into the process of leadership." The age of the individual leader seems to be at an end. The complexity of the modern world system could require a more subtle model of military command. Command collectives, not individualists, may be needed, and King's book tries to tell the story of the emergence of a new kind of leadership for the 21st century.

The fact is that all command is collective and no general can command alone, since any military operation necessarily involves the cooperation of others. Yet in different eras, command has assumed different forms, sometimes more collaborative, other times more individualist. "Consequently, while the fundamental nature of command always endures, its specific character is mutable," according to the author. He claims that notwithstanding continuities and recognising the fact that command is always collaborative, two distinct, if overlapping regimes are observable over the last century – an individualist practice of command from 1914 to 1991, which has been superseded by collective command since the millennium.

The book skilfully examines the practice of mission definition, management and motivation in the Western army division, from the First World War to the present day. In doing so, King has brought to light the significant changes that have taken place in the role and structure of command over the course of a century. **JS**

Image: Alamy

PANZERARTILLERIE

FIREPOWER FOR THE PANZER DIVISIONS

Author Thomas Anderson **Publisher** Osprey Publishing **Price** £30

RENOWNED HISTORIAN OF GERMAN ARMOUR THOMAS ANDERSON TAKES READERS ON A TOUR OF THESE UNIQUE MACHINES, CATALOGUING THEIR TRIUMPHS AND FLAWS IN COMBAT

As the German Army formed their new doctrine of mobile warfare based around fast moving armoured columns (Blitzkrieg) in the 1930s, it became clear that artillery was going to be a major problem. Traditional horse-drawn or even motor-drawn field guns could not keep up with the tanks on the move, nor reposition fast enough to support them in action. Instead, self-propelled guns (Panzerartillerie) were developed, in a process fraught with problems. There were never enough resources or factory capacity to keep up with demand, and many types had to be converted from obsolete or captured tank hulls. This ad hoc approach led to numerous technical difficulties, and numbers were seldom sufficient to meet demand.

As an acknowledged expert on German armour Thomas Anderson provides a comprehensive account of the development of Panzerartillerie, before going on to provide a brief overview of the many experimental or production designs, and the technical or tactical issues that beset them. The author also traces the evolution of the way the Panzerartillerie were organised and used, and includes extensive extracts from reports from different units on campaigns, including in Poland in 1939, on the Eastern Front, and in Italy. This 256-page book is well illustrated with black and white photographs of different vehicle types, and supported by tables of technical specifications, orders of battle, and organisational charts. **SH**

Explore the development of the concept of Panzerartillerie

"THIS BOOK LOOKS AT THE DEVELOPMENT OF THE CONCEPT OF PANZERARTILLERIE BEFORE GOING ON TO PROVIDE A BRIEF OVERVIEW OF THE MANY EXPERIMENTAL OR PRODUCTION DESIGNS, AND THE TECHNICAL OR TACTICAL ISSUES THAT BESET THEM"

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5 BEST BOOKS ON

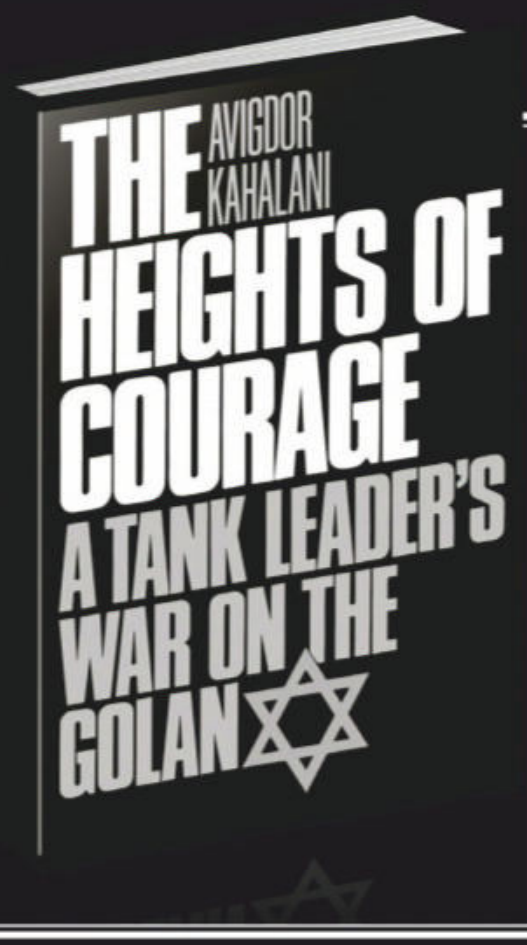
VALLEY OF TEARS

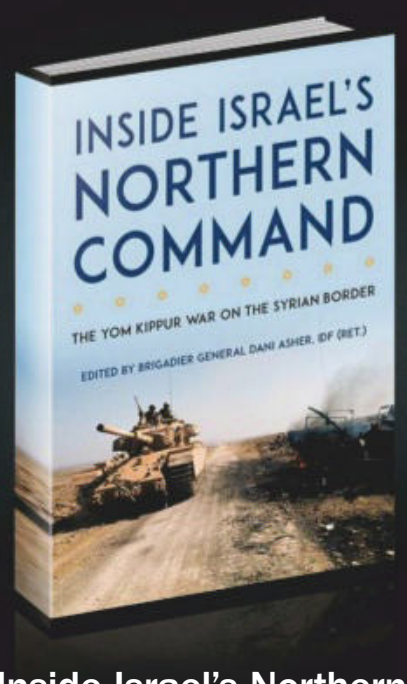
During the brief but bloody Yom Kippur War in 1973, Israeli and Syrian armoured formations engaged in one of the largest tank confrontations since WWII

The Heights of Courage: A Tank Leader's War On The Golan
Avigdor Kahalani

As the commander of one of Israel's tank battalions during the four-day battle, Avigdor Kahalani's book provides a unique blow-by-blow experience of the battle from his perspective, as well as the men under his command. Although first-hand accounts such as this are critical to a full understanding of any battle, and on this topic they are rare in English, it does not provide the full context of the Yom Kippur War and the broader strategies at play, which might make newcomers to the subject left wanting.

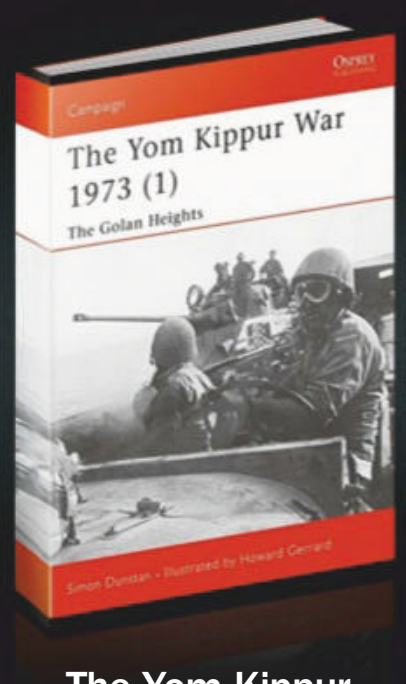
"AVIGDOR KAHALANI'S BOOK PROVIDES A UNIQUE BLOW-BY-BLOW EXPERIENCE OF THE BATTLE FROM HIS PERSPECTIVE, AS WELL AS THE MEN UNDER HIS COMMAND"





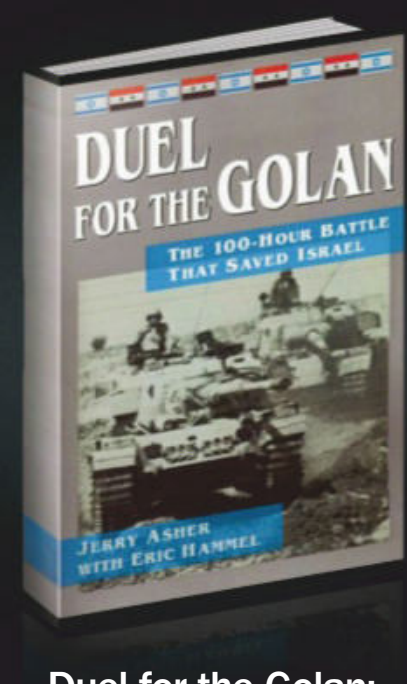
Inside Israel's Northern Command: The Yom Kippur War On The Syrian Border
Ed. Dani Asher

With contributions from several prominent IDF veterans who were in command during the conflict, this is one of the most thorough histories of the war from the Israeli perspective, providing details on the tactical and strategic level.



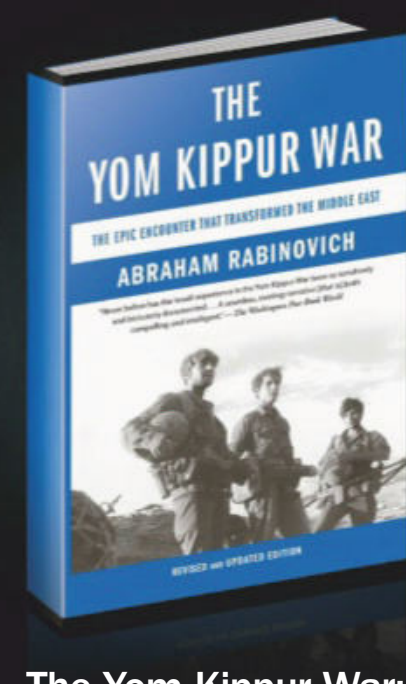
The Yom Kippur War 1973: The Golan Heights
Simon Dunstan

Separated into two parts covering Israel's frontlines against Syria and Egypt, Simon Dunstan's series provides a thorough breakdown of the Yom Kippur War. He describes the deployments of both sides, the key engagements and the critical turning points of the war.



Duel for the Golan: The 100-Hour Battle That Saved Israel
Jerry Asher & Eric Hammel

Including personal accounts from the frontline, from both Israeli and Syrian perspectives, this work provides a more rounded account of the conflict. Asher and Hammel also present the Syrian strategy, detailing the country's plans and buildup of forces in preparation for the offensive.



The Yom Kippur War: The Epic Encounter That Transformed The Middle East
Abraham Rabinovich

Working from recently de-classified reports, Abraham Rabinovich describes the intense intelligence operations preceding and during the conflict, as well as the wider context of the war's significance, and its repercussions for the region.

GREATEST TANKS

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Three brand-new 1:35 scale models will be won by one lucky History of War reader

Although renowned for its iconic aviation scale models, in 2019 Airfix is due to release a new range of WWII tank kits. Collectors and modellers will now be able to re-create some of the most prolific machines of the war, including the Tiger I, Panther and T-34. These beautifully detailed 1:35 kits are currently available for pre-order, due to be released in May, 2019. For more information and the full range of Airfix's latest model releases, please visit: **www.airfix.com**

This issue, **History of War** readers have the exclusive chance to win a fantastic bundle of three 1:35 scale tank kits: an M3 Stuart "Honey", Tiger I (Early version) and a Pz.Kpfw.35(t). This bundle is worth a total value of £81.97. For your chance to win, simply visit **HistoryAnswers.co.uk**

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M3 STUART
Honey (British Version)

The British named the M3 "General Stuart" upon receipt of the tank under the Lend-Lease program in June 1941. The tank's ability to "shoot and scoot" as well as keep the crew safe from small fire arms fire, earned it the affectionate nickname "Honey". The M3 could travel 10-20mph faster than many contemporary vehicles, and was relatively easy to maintain.

The M3 was equipped with two 30-cal Browning machine-guns and a 37mm M6 gun. Though this was adequate early in the war, by 1942 German counterparts far surpassed the M6's effective range, but the narrow width of the Honey could not accommodate a larger gun.

GERMAN LIGHT TANK
Pz.Kpfw.35(t)

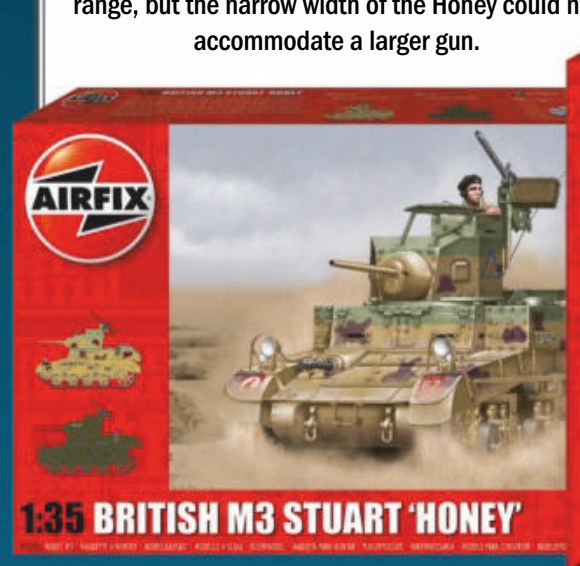
The Panzerkampfwagen 35(t), commonly shortened to Panzer 35(t) or abbreviated as Pz.Kpfw. 35(t), was a Czech designed light tank used mainly by Nazi Germany during World War II. The letter (t) stood for tschechisch (German: "Czech"). In Czechoslovakian service it had the formal designation Lehký tank vzor 35 (Light Tank Model 35).

In German service, the tank saw combat early during WWII, notably the invasion of Poland, the Battle of France and the invasion of the Soviet Union before, being retired or sold off in 1942; the fighting in Russia having exposed the vehicle's unsuitability for cold weather operations and general unreliability.

TIGER-1
Early Version

Production of the Tiger I began in August 1942 at the factory of Henschel und Sohn in Kassel, initially at a rate of 25 per month and peaking in April 1944 at 104 per month. By August 1944, when production ceased, 1,355 Tigers had been built. On 23 September 1942, a platoon of four Tigers went into action near Leningrad.

Deploying in swampy, forested terrain, their movement was largely confined to roads and tracks, making defence against them far easier. During this engagement one Tiger became stuck in swampy ground and had to be abandoned. Captured intact, it enabled the Soviets to study the design and prepare countermeasures.



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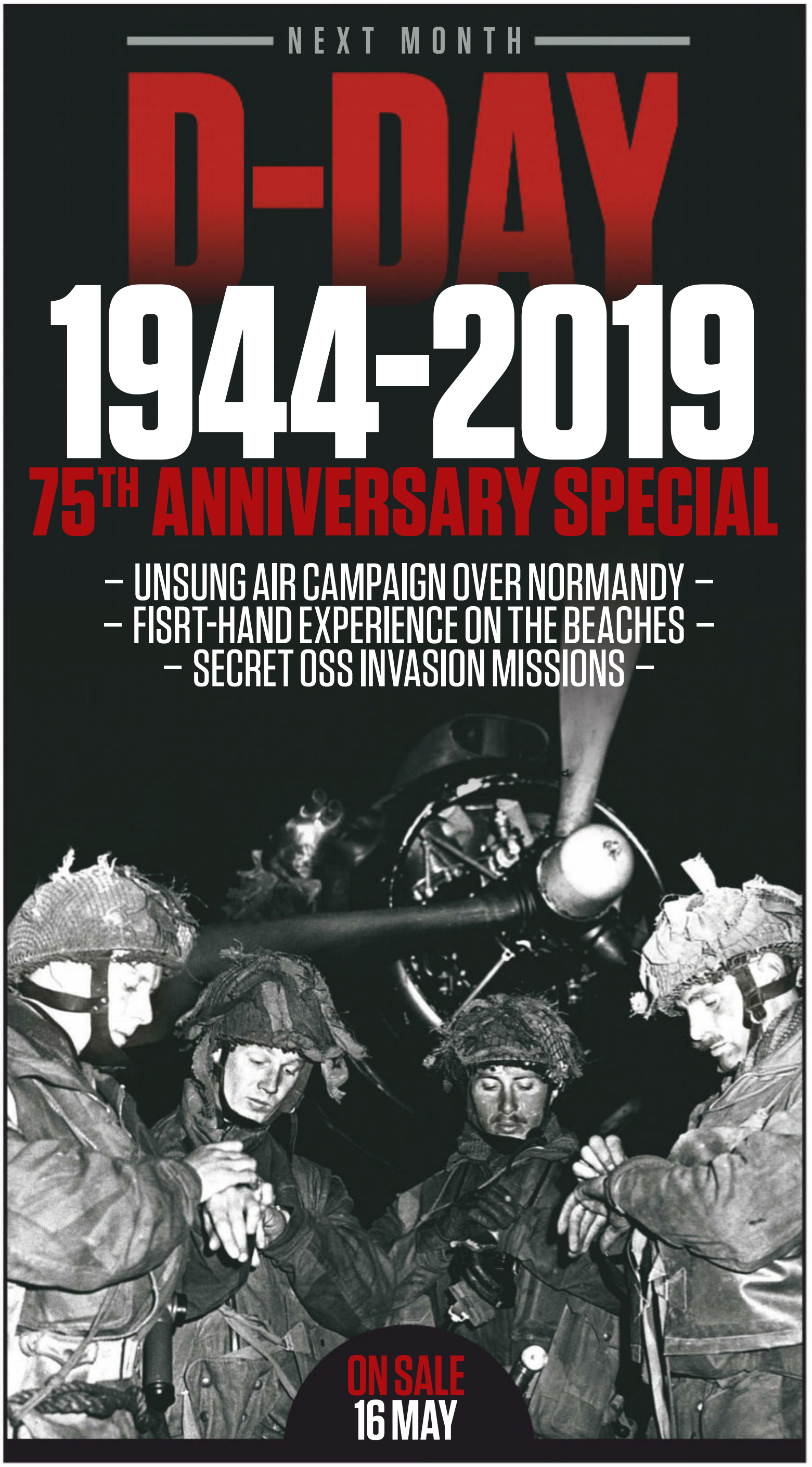

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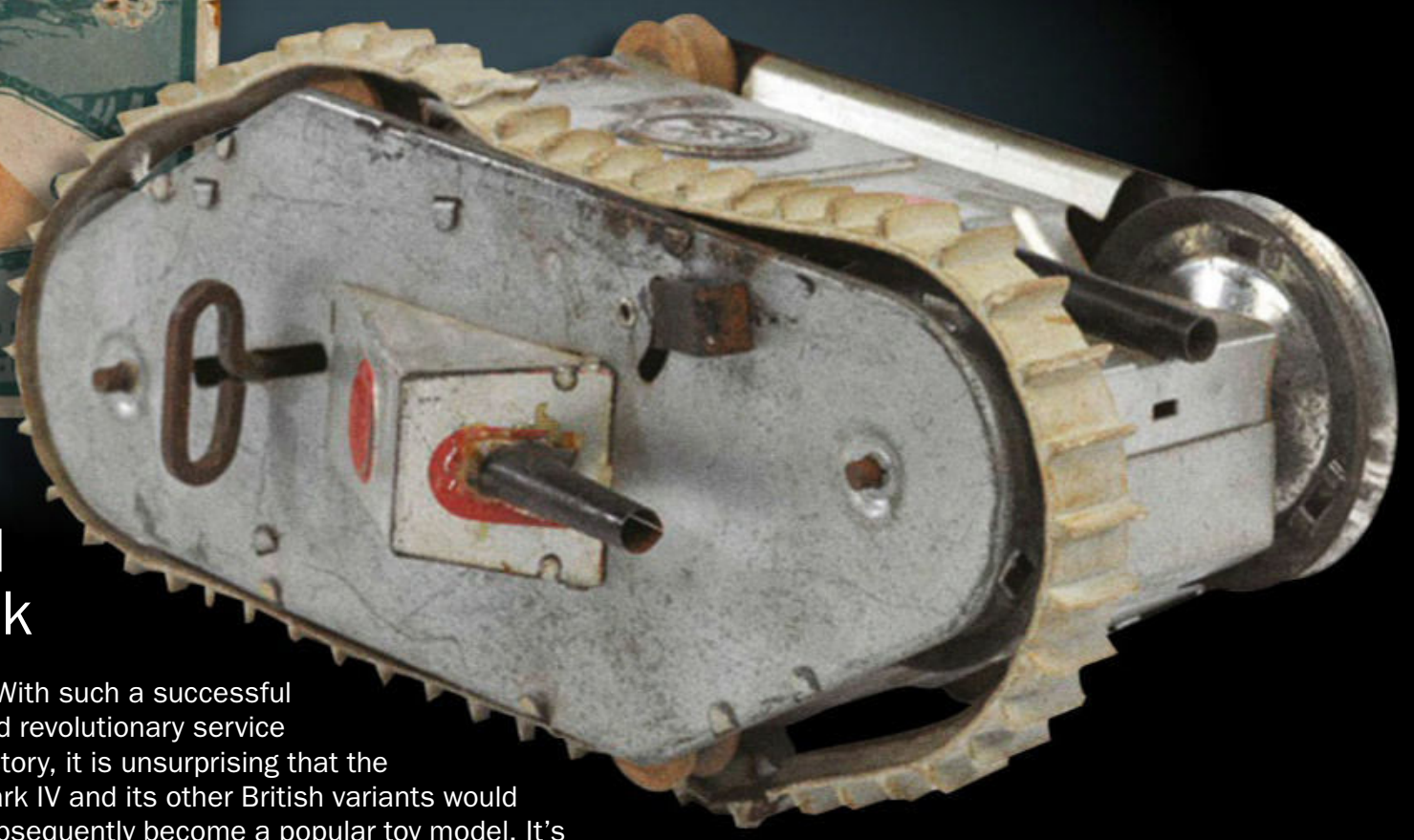
TURNOVER TANK

The tank would have been packaged as part of an 'Artillery Set' that also contained a model field gun and a two-wheeled cart called a 'limber'

"WITH SUCH A SUCCESSFUL AND REVOLUTIONARY SERVICE HISTORY, IT IS UNSURPRISING THAT THE MARK IV AND ITS OTHER BRITISH VARIANTS WOULD SUBSEQUENTLY BECOME A POPULAR TOY MODEL"



This clockwork toy was produced in the 1930s and based on a British WWI tank

This toy was made by Louis Marx and Company Limited in 1931. Louis Marx was initially established in New York in 1919 but production began in Dudley, Worcestershire in 1931. This particular tinplate, clockwork model was based on a World War I armoured vehicle, most probably a British Mark IV tank.

Mark IVs were an improved version of the original Mark I tank and they were first introduced at the Battle of Messines in June 1917. Almost 460 were used during the Battle of Cambrai in November 1917, which marked the first large-scale effective use of tanks in warfare. A Mark IV was also the first to win a 'tank versus tank' action in April 1918 when it knocked out a German A7V at the Second Battle of Villers-Bretonneux.

With such a successful and revolutionary service history, it is unsurprising that the Mark IV and its other British variants would subsequently become a popular toy model. It's rhomboid shape also helped in the Marx design to make it a clockwork 'turnover' tank that could be flipped upside down while in motion.

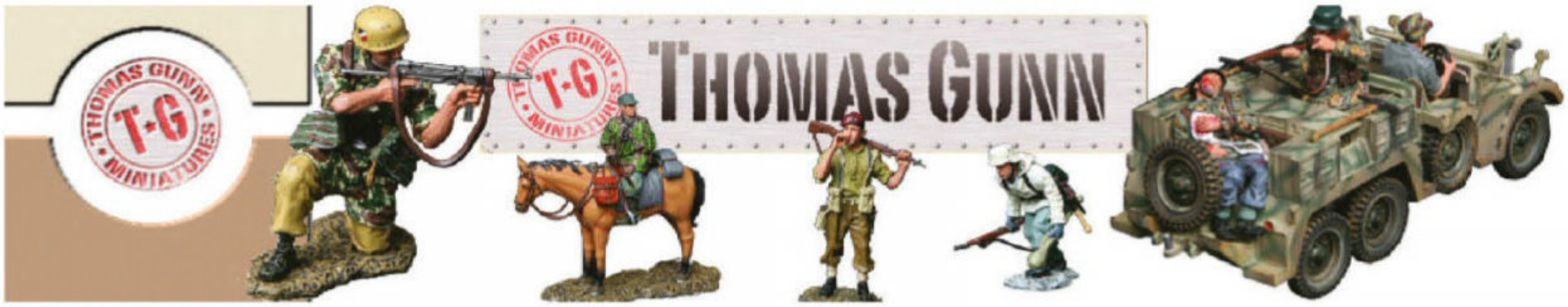
Marx toys were inexpensive to produce and had uncomplicated designs with a sturdy, durable construction. This model was very popular in Britain although their American equivalent was called a 'Doughboy Tanker' and contained a small soldier that popped up from a rear turret. Their low cost meant that they were marketed to a wide audience, including families who were experiencing financial hardship during the Great Depression of the 1930s.

Because of the popularity of toys such as this tank, Louis Marx and Company was the largest toy manufacturer in the world by the 1950s

NATIONAL ARMY MUSEUM

The Turnover Tank is held in the collections of the National Army Museum in Chelsea, London. For more information visit: nam.ac.uk

Image: National Army Museum



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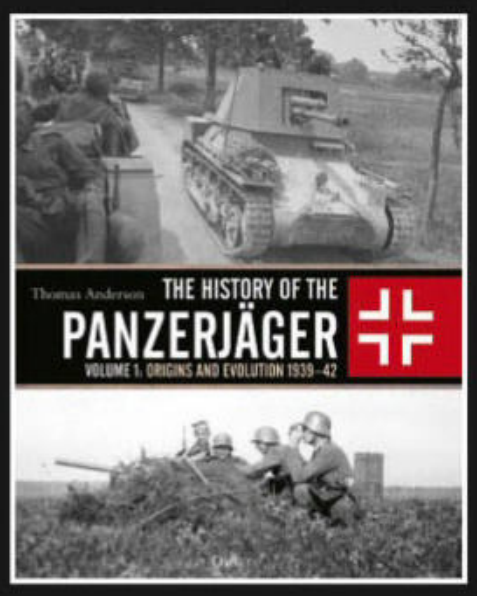

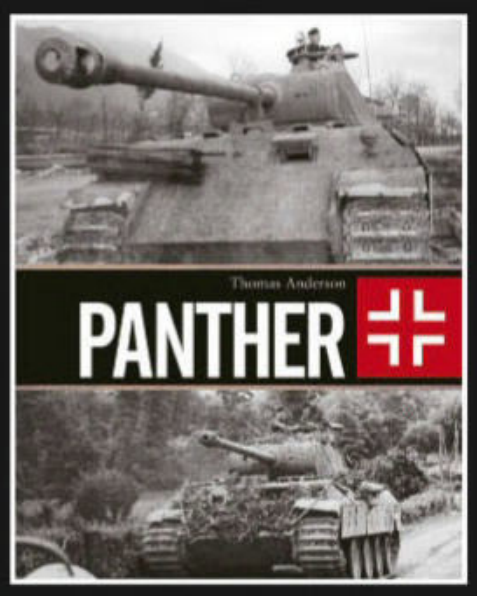

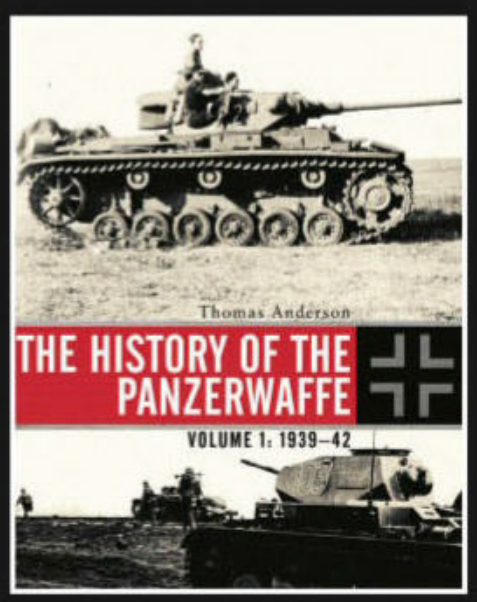

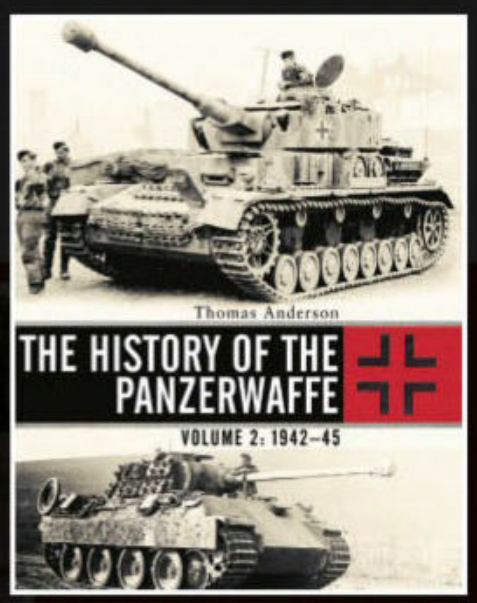

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